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PEABODY MUSEUM OF AMERICAN ARCHAEOLOGY
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Vol. XV. — No. 1

THE SWARTS RUIN
A TYPICAL MIMBRES SITE
IN SOUTHWESTERN NEW MEXICO

REPORT OF THE MIMBRES VALLEY EXPEDITION
SEASONS OF 1924-1927

By H. S. AND C. B. COSGROVE

WITH AN INTRODUCTION BY
ALFRED VINCENT KIDDER

AND A SECTION ON THE SKELETAL MATERIAL BY
WILLIAM WHITE HOWELLS

TWO HUNDRED THIRTY-NINE PLATES
AND SEVENTEEN ILLUSTRATIONS IN THE TEXT

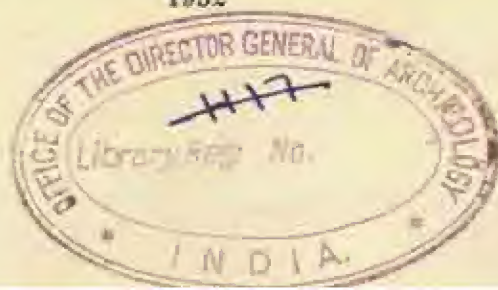
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FOREWORD

THIS report records the results of investigations by Mr. and Mrs. C. B. Cosgrove of the Peabody Museum staff, at the Swarts Ruin in the Mimbres Valley, New Mexico. The work, which was carried on during the summer months of the years 1924 to 1927 inclusive, was made possible by the generous contributions of the following friends of the Museum: Frederick Ayer, Walter C. Baylies, Charles L. Bernheimer, William B. Cabot, Miss Ellen S. Chamberlain, Selah Chamberlain, Mr. and Mrs. W. H. Claflin, Jr., John W. Converse, Bronson W. Cutting, Carl P. Dennett, Dr. Roland B. Dixon, Walter Douglas, William North Duane, George Eastman, Mr. and Mrs. Raymond Emerson, Walter Fitch, Desmond Fitzgerald, Dr. Henry W. Gillett, Conrad G. Goddard, W. T. Grant, Lawrence Grinnell, Theodore E. Hambleton, Augustus Hemenway, Henry Hornblower, Clement S. Houghton, Daniel C. Jackling, Mr. and Mrs. Percy Jackson, Francis S. Kershaw, Estate of John M. Longyear, Mrs. Thornton K. Lothrop, George D. McCreary, Jr., Philip A. Means, Benjamin Moore, Victor Morawetz, W. O. Morgan, Everett Morss, John Wells Morss, Dr. Newton Otis, Ario Pardee, George A. Peabody, Mrs. Jeanette B. Peabody, Waite Phillips, Dudley L. Pickman, Frank B. Porter, Dr. Francis I. Proctor, Miss Lillian E. Prudden, J. G. Rosengarten, Jr., Donald Scott, E. Chapman Smith, Daniel R. Sortwell, Mrs. Samuel D. Stevens, Whitney Stone, Dr. E. G. Stillman, Dr. Henry O. Taylor, Mrs. Bayard Thayer, John E. Thayer, Mrs. C. C. Thompson, Dr. A. M. Tozzer, Mrs. Bayard Tuckerman, Jr., Miss Mary C. Wheelwright, Miss Amelia E. White, James W. Young.

Through his unflagging interest in the archaeology of the Southwest, Dr. A. V. Kidder was able to arouse others to the importance of the Mimbres area, and thus make possible the reconnaissance of the region and the excavations carried on at the Swarts Ranch. The appreciation felt for the interest he showed during the field work and, at its conclusion, his valuable counsel in the laboratory, and lastly his friendly criticism of the manuscript of this report,

cannot be overemphasized. Mr. S. J. Guernsey also contributed from his large fund of knowledge to the necessary study of specimens brought to the Museum. Through the good offices of Dr. E. A. Hooton, Mr. W. W. Howells was enabled to report on the skeletal remains. The faithful reproduction of Mimbres vessels, used as the frontispiece, was made by Mr. F. R. Orchard. Mr. F. A. Gonyer carried out the tests necessary to determine the pigments employed in the decoration of the pottery. The help given by Dr. Kirk Bryan in identifying the material used in the stone specimens; that of Dr. Glover M. Allen, who identified the animal and bird bones; and the identification of the desert plants by Dr. I. M. Johnston are greatly appreciated. Thanks are also due to C. B. Cosgrove, Jr., who acted as field assistant throughout the summer of 1925, and to Mr. Karl Ruppert, who volunteered his services during part of the 1927 season.

Finally the Museum takes this opportunity to extend its thanks to the Carnegie Corporation of New York and to Mr. C. A. Stone for their generosity in financing the publication of this report.

EDWARD REYNOLDS, *Director*

CAMBRIDGE, MASSACHUSETTS
January, 1932

INTRODUCTION

For many years the prehistoric culture of the Mimbres Valley in southwestern New Mexico was the Cinderella of Pueblo archaeology. Overshadowed by the spectacularity of the great cliff-houses and open ruins of the San Juan, and the huge adobe structures of the Gila and of Chihuahua, the inconspicuous mounds which marked the former homes of the ancient Mimbresños failed to attract the serious attention of students, although as far back as 1850 John Russell Bartlett, during his survey of the boundary between Mexico and the United States, passed through the Mimbres country, noticed mounds and referred, in his "Personal Narrative," to pottery of fine texture. The tireless Bandelier, plodding afoot the length and breadth of the Southwest, crossed the region in 1884. He describes the ruins with his usual accuracy, but as he did not dig in them he remained unaware of what they concealed. Duff in 1902, Hough in 1907, Webster in 1912, published short notices upon the archaeology of the Mimbres.¹ Their papers, however, gave little indication of anything out of the ordinary, and, as I have said, Southwestern archaeologists were busy elsewhere.

Had the reports of the above investigators, particularly that of Hough, been read with more care, it might have been realized that the pottery of the Mimbres possessed an unusual amount of naturalistic decoration. If any one, however, gave the matter more than a passing thought, he probably felt, as I did before 1914, that the specimens mentioned by Hough must be stray pieces of Chihuahua ware, which are sometimes decorated with figures of birds and human beings. At any rate, archaeologists still took no special interest in the region, and it remained for a local layman, Mr. E. D. Osborn, of Deming, New Mexico, to bring to light the hidden treasures of these neglected ruins. Mr. Osborn found, I imagine about 1910, that the old people of the Mimbres had buried their dead beneath the floors of their houses; and that the bodies were accom-

¹ The titles of these works will be found in the bibliography.

panied by offerings of pottery bowls bearing geometric designs of superlative beauty, supplemented and enriched with paintings of insects, fishes, birds, beasts, and even human beings, executed with a charmingly quaint blend of the conventional and the realistic.

Mr. Osborn amassed a large number of the bowls. He wrote of them to various scientific organizations. Thus Dr. J. W. Fewkes learned of the existence of this remarkable ware. He went at once to Deming and, as every one must, he fell in love with Mimbres pottery at first sight. Promptly purchasing the Osborn collection for the National Museum, he based upon it his "Archaeology of the Lower Mimbres." This appeared in 1914 and was followed by a series of shorter papers illustrating vessels subsequently gathered by Mr. Osborn and others. But Dr. Fewkes was so fully occupied by his important researches on the Mesa Verde that he never was able to fulfil his often-expressed desire to excavate a Mimbres ruin. Any one who had the privilege of being in the field with the genial, kindly, enthusiastic "Doctor" can realize how keenly he would have relished digging in sites so fruitful.

Osborn, then, discovered the archaeological possibilities of the Mimbres: Fewkes was the first to appreciate the importance of its pottery and to make it known to the scientific world. But to the authors of this book belongs the credit for understanding that the Mimbres ought *not* to be a mere collecting ground for handsome bowls; and for grasping the fact that its ruins should be saved from random and wasteful looting. It was also due to their efforts that there were ultimately brought about the careful investigations which have been made during the past decade. The Cosgroves' activities in promoting research in the Mimbres have been so unusual and so effective that they deserve record in this, their first major publication.

Mr. Cosgrove was a business man of Silver City. About 1911 he and Mrs. Cosgrove became interested in the ruins of that neighborhood and of the Mimbres Valley to the east. They collected specimens from the surface and excavated in various sites. The Fewkes publication, and particularly the substantial price paid for the Osborn pottery had, in the meantime, led many other people to dig, but, as a rule, their sole preoccupation was the recovery of bowls, of which they broke fully as many as they succeeded in getting out whole. They seldom bothered at all with cracked or otherwise un-

attractive vessels, and they naturally assembled no data whatever. The Cosgroves, sensing the inevitable result of such vandalism, set about attempting to protect the ruins. They persuaded ranchers to post their properties. And, in 1919, they bought a piece of land upon which were the remains of a typical Mimbres village.

With the purchase of Treasure Hill, for so they christened the place, the Cosgroves were definitely launched upon their career as archaeologists. I use the term advisedly, for even in those first days of their interest in the Mimbres, long before they had the slightest idea of going into the work professionally, they acted as archaeologists rather than as pot-hunters. Their digging was of necessity intermittent, for it could be done only on Sundays and holidays. But they kept notes, made plans, took photographs, saved every sherd and bone and broken tool. Treasure Hill proved to be a rich site. Its investigation raised many technical problems. So, in the summer of 1920, they spent their vacation studying field methods at the excavations of F. W. Hodge at Hawikuh, of N. M. Judd at Pueblo Bonito, and of the writer at Pecos.

Although Mr. and Mrs. Cosgrove were fully occupied with their own investigation they found time to work for the further promotion of Mimbres archaeology. At their invitation Messrs. Chapman, Bradfield, and Bloom of the New Mexico State Museum made a reconnaissance of the district in 1922; and during the same year the Cosgroves aroused the interest and enlisted the help of Mr. John M. Sully and Mr. D. C. Jackling of the Chino Copper Company, brought them into touch with the State Museum, and so made possible the inauguration, in 1923, of the excavation of the Cameron Creek village, a project recommended by them, backed by Mr. Jackling and Mr. Sully, and carried out by the late Wesley Bradfield, whose splendid report has just come from the press. The Cosgroves' efforts also led to work on the immensely important Galaz site by the Southwest Museum, their son, Burton, being in charge. They helped E. H. Morris to secure excavation rights for the University of Colorado at several ruins; they assisted Paul H. Nesbitt of Beloit College in making arrangements for digging in the Mimbres country.

In 1924 Mr. and Mrs. Cosgrove joined the staff of the Peabody Museum. Their first undertaking was a survey of the Mimbres Valley in search of a site for intensive investigation. The Swarts

Ruin was selected because of its central location; because of the apparent purity of its pottery, as revealed by surface indications; and because it had been relatively little harmed by pot-hunters. Excavation began that summer and was concluded in the autumn of 1927, four complete field seasons having been devoted to the work. In 1928 and 1929 the Cosgroves were engaged in exploration and digging in caves. The results of that investigation will be contained in a paper now in preparation.

Archaeology, being essentially an historical study, requires, after its primary descriptive and analytical processes have been accomplished, that its facts be arranged in chronological order to the end that they may ultimately be interpreted in terms of the laws of the material and social evolution of the human race. It, therefore, becomes our duty to place, if possible, the Mimbres culture, of which the Swarts Ruin is a very typical exemplification, in its proper chronological niche. For any such assignment of a Southwestern group we are forced to turn, at present, to the so-called "Pecos chronology" which, for better or worse, provides our only ordered sequential ranking of Southwestern cultures. According to the Pecos hypothesis, the first agricultural people of the Southwest were the Early Basket-makers, whose remains have been found in greatest abundance in the caves of the San Juan drainage in southern Utah and northern Arizona, but who doubtless actually occupied a much greater range. They lived, it seems sure, before the time of Christ. They grew corn; but they built few, if any, permanent houses; and they had no pottery. Their descendants, the Late Basket-makers, learned, for a guess at about the time of Christ, to mould vessels of clay and to fire them, and developed a crude but efficient architecture. These Late Basket-makers were eventually succeeded by people, apparently of an invading race, who took over and perfected their culture. The immigrants, if such they were, are called Pueblos, because they were without much question the direct ancestors of the Pueblo Indians found occupying the region when it was discovered by the Spaniards in the sixteenth century. The history of the Pueblos is becoming better and better known with each succeeding year of archaeological investigation. We are already certain that in Pueblo I (the first stage, which lasted from perhaps 400 to 600 A.D.) there was considerable uniformity of culture over the whole northern area; that in Pueblo II (600-800 A.D.) local

specialization began; and that the height of Southwestern achievement was reached in Pueblo III (800? to 1300 A.D.; the latter date is, thanks to Douglass's tree-ring studies, now certain). Pueblo III was marked by a strong intensification of local cultural differences; by great progress in the material arts; and, to judge from the large and numerous ruins, by a notable increase in population, with corresponding developments in social and religious organization. Pueblo IV, the Late Prehistoric period, saw a general break-up of earlier groups, wholesale abandonment of territory, a rearrangement of population, a certain measure of cultural retrogression. The Spaniards came in 1540.

The above historical outline has been worked out by archaeological research in the northern part of the Southwest, principally in the drainages of the San Juan, the Little Colorado, and the upper Rio Grande. The course of events in the southern regions, on the Gila and its tributaries, and in Chihuahua, is less clear. Until recently it was thought by certain students, myself included, that the culture of the Gila was a sort of outlying and bastard blend of Southwestern and Mexican elements. But the current work of Cummings and Gladwin and Woodworth seems to show that the Gila, and perhaps also Chihuahua, must be reckoned with as the theater of a development perhaps quite independent, and one which, in Pueblo IV at least, may have exercised no little influence upon its northern contemporaries. Be that as it may, we can no longer permit ourselves to neglect cultures on the outskirts of what we usually have considered the Pueblo nucleus. Study of the peripheræ is becoming of more and more importance, because knowledge of what happened in such regions permits us, by checking back, to verify or disprove our theories regarding the course of events in the postulated nuclear area; it also provides us with extremely interesting and fundamentally significant data regarding the diffusion and interaction of cultures.

From the point of view of the northern or San Juan nucleus, the Mimbres is peripheral, both geographically and culturally. What was going on there in very early times is far from clear. Objects closely resembling those of San Juan Basket-maker II have been found in local and nearby caves; their age, however, relative to the northern materials, is unknown. This point of chronology needs settling, for the Mimbres lies on one of the most practicable routes

between Mexico, whence the seeds of Southwestern culture came, and the north, where, according to our present hypothesis, they sprouted. Of Basket-maker III no trace is yet on record from the Mimbres nor, indeed, from any adjoining district. Remains probably attributable to Pueblo I were found by Hough at Luna, some hundred miles to the northwest; and sherds of apparently Pueblo I and fragments of two vessels assignable to Pueblo II came from the Swarts Ruin, but these are almost surely not contemporaneous with the occupancy of Swarts. Pueblo II is an ill-defined and little-understood period even in the north. In this Valley the flowering of the Mimbres culture took place, according to all present indications, during Pueblo III.

At about the same time that the typical Pueblo III groups were shaping themselves in the north, there sprang up in the Mimbres Valley a host of small villages. Who were the people that built them, we do not know. Nor can we tell whether they came from elsewhere or whether they were scattered indigenous semi-nomads, coagulated into settled communities through assimilation of the Pueblo way of life. These things we can and eventually shall find out. But northern influence played at least some part in whatever happened, for after what seems to have been a short period of existence in clusters of semi-subterranean hovels, the Mimbresños began to build rectangular, above-ground houses and to group them, albeit blunderingly, one against another in a vague imitation of the northern arrangement. In architecture they never advanced beyond this quasi-pueblo style. But in the making of pottery they stood unrivalled and supreme. No ware of the Southwest can approach that of the Mimbres either in technical perfection of brushwork, or in the variety, freedom, and sheer boldness of its decorative conception. It is amazing stuff. By all theoretical rights it should have been the culmination of a long growth; it should have been produced in one of the great centres of Pueblo development, in Chaco Canyon, for instance, or on the mesas of the McElmo drainage. But here in the Mimbres it springs, apparently, from nothing; its makers achieved little else of consequence, either practical or artistic.

Mimbres pottery was, of course, not literally unfathered. It could not have been an independent invention. Certain crude wares of doubtful date, relative to general Southwestern chronology, were

found in the region by Wesley Bradfield. But because of his untimely death they have not yet been described. They perhaps represent the bare ceramic foundation. Certain technical processes surely came from the north: the corrugation of cooking wares, for example; the use of black paint on white backgrounds. From the same direction came a complex of devices for geometric decoration: the ubiquitous key-figure, the scroll, hachure, checkerboarding; all these are standard Pueblo motifs. It appears, then, that a local primitive pottery-making industry was richened by imported methods and ornaments. But similar concatenations occurred again and again during Southwestern history without producing any such startling results. Moreover, the astonishing superadded burst of Mimbres naturalism has no analogue in any other region.

All in all, it seems to me that we must attribute this extraordinary efflorescence to the influence of a single potter, whose work was so outstanding that during her lifetime she was able to overcome the conservatism of her contemporaries and to found a school of brilliant decorators. I can account for the observed phenomena in no other way. Mimbres ware has to me all the earmarks of an abrupt and profound artistic mutation. And how otherwise than by the creative effort of an individual can any artistic mutation be brought about?

The problems of the Mimbres can only be solved by long and intensive research, involving the most intelligent sort of excavation in the Valley and in adjoining areas, together with detailed analytical and comparative studies of the materials collected. But, in the Mimbres, we cannot look forward to many years of opportunity to do any research at all, for the ruins are being gutted at a pace distressing to contemplate. The cause of this, of course, is that the sites are easy to locate; the burials lie at no great depth, directly under the floors of the rooms; and almost every skeleton is accompanied by one or more very beautiful bowls. Also, the mounds, being for the most part upon privately owned land, cannot receive even the weak protection afforded antiquities on the public domain. Finally, much Mimbres pottery has been purchased, at good prices, by museums. A more perfect set-up for pot-hunting could hardly be imagined.

What can be done about it? One very simple palliative would be the absolute refusal of institutions to buy collections, thus auto-

matically cutting off the pot-hunter's best market. This, however, would by no means stop the destruction, because the average person digs more for fun than for profit. The best way, in fact the only really effective way, to stop such digging is to create public sentiment against it, to bring people to realize that every sacked ruin means a page irretrievably torn from the book of human history. If this were understood, I am sure that many who now thoughtlessly excavate would cease to do so, and that owners would be less ready to allow work on their land. But how can one make it clear that the ruins are really worth preserving? How is it possible to demonstrate that the lives of these old Mimbrenos, who accomplished their destiny so many hundreds of years ago in this little corner of southern New Mexico, can teach us moderns anything of value? How may we show that the evidence destroyed by a single Sunday of shovelling in an ancient site might have given us an all-important link in our reconstruction of the past? In other words, how can we prove that archaeology is worth while? Is it, indeed, worth while? Not, certainly, as much of it as has been done. Many so-called archaeologists have been little or no better than the pot-hunters they so vehemently condemn. We must do our own work outstandingly well before we try to stop the pleasure and the possible profit of others.

A word as to the arrangement of the materials in this book. The specimens, other than pottery, are fully described, the information regarding each category of objects being presented in condensed form at the beginning of the section devoted to it. This has saved much labor in writing. It also renders the material very easily accessible for comparative study, and so may, perhaps, prove of value as a start toward the development of a precise, orderly, and uniform method for the recording of technological details. Something more efficient than the present haphazard, quasi-literary way of describing specimens, now in vogue in American archaeological publications, is badly needed. Some system, perhaps akin to that used in ornithological works, should be devised, which will assure the inclusion of all pertinent information as to size, shape, color, material, workmanship, etc. of artifacts; which will facilitate comparative study, and which will shorten the time now usually spent in the toilsome construction of sentences and paragraphs about things

much more expeditiously and clearly set forth in abbreviated, if not actually in tabular, form.

The collections from Swarts are thoroughly illustrated. It has been thought that good pictures are, in the present state of our knowledge at least, of greater value than any amount of verbal description. Particularly is this true of pottery. We know so little, as yet, about what is or is not significant; we are so far from being able to choose a dozen or a score of vessels and be sure that they are adequately representative, that it seems best, whenever possible, to make available for students the entire ceramic product of any given excavation. And in the case of a decorative system so rich and so complex as that of the Mimbres, it is obviously important to build up a large corpus of material for use in the analytical studies of design which alone can bring success in our attempt to understand the relationship between Mimbres art and that of other South-western groups. For this reason every pot from Swarts has been figured. It will be noticed, however, that Mr. and Mrs. Cosgrove have neither described nor analyzed the decorations, nor attempted to accomplish more than a preliminary classification. To have gone further at this time would have involved many months of work, with corresponding delay in making the collection available for other archaeologists. The Cosgroves, too, have on their hands a large and very important accumulation of specimens and records from the caves which they excavated in 1928 and 1929. These must be digested and published as soon as possible, for they will throw much light on the now very little understood early cultures of the region.

A. V. KIDDER

ANDOVER, MASSACHUSETTS

January, 1932



THE SWARTS RUIN

A TYPICAL MIMBRES SITE IN SOUTHWESTERN NEW MEXICO

REPORT OF THE MIMBRES VALLEY EXPEDITION
SEASONS OF 1924-1927

TOPOGRAPHIC SETTING

The Mimbres River and its Tributaries. The prehistoric Indian people who, in the absence of all knowledge of their true name or tribal affinities, we call the Mimbrenos, occupied a considerable territory in what is now southwestern New Mexico. The heart of their range was the Mimbres Valley. The Mimbres River and its tributaries drain the foothills and elevated plains of the southeastern section of Grant and the northwestern part of Luna Counties, New Mexico. (See map, Plate 237.) The country has an elevation of 4500 to 6000 feet and is bounded on the north by the Pinos Altos Range, on the east by the Mimbres Mountains, and on the west by the Burro Mountains. The valley is separated from the more open country south of Silver City by a spur of the Pinos Altos Range.

Drainage is to the south. The Mimbres River, no more than a fair sized brook, rises on the west side of the Mimbres Mountains thirty-five miles northeast of Silver City. Water from the Continental Divide, north of Silver City, also flows into the Mimbres. Forty miles from its source, and east of Faywood at Old Town (a point of entry from Mexico before the Gadsden Purchase of 1853) the river reaches flat untimbered country, where its course becomes a dry channel carrying surface water only during the rainy season. Its underground flow, however, continues southward after it sinks into the sands at Old Town, to fill an extensive subterranean reservoir below the city of Deming, whence it seeps still further south to end in the interior basin of northern Chihuahua.

Small ruins are to be found scattered over the open country south of Silver City, but the larger prehistoric villages are encoun-

tered near the foothills and are most numerous in the Mimbres Valley itself, which is seldom more than a quarter of a mile in width. According to reports of early settlers, the flow of the stream through the wooded upper valley was formerly more constant, nor was it subject to the sudden rises of today. Plate 2, *a* and *b*, shows the river at low and flood stages. Devastatingly wasteful cutting of timber and heavy overstocking of the range in late years have so greatly reduced the grass and other vegetation that there is nothing to hold back the water which rushes down from the headwaters and precipitous side canyons in violent torrents, cutting away the soil, washing gravel over the bottom lands, and, in some sections of the valley, leaving the river channel a mere boulder-strewn ditch. The lowering of the stream bed and cultivation of the ground have drained many marshes in the valley, around which the Indians probably once planted their corn.

Plate 3, *a*, is a view to the south from the Swarts Ranch, showing part of the Mimbres Valley, with the mountains of the Cooks Peak Range in the background. It depicts very well the heavy vegetation along the stream, the present-day agriculture, and the surrounding hills which in the past were the grazing lands of deer and antelope.

RESOURCES OF THE REGION

Timber. Among the natural resources of the country in prehistoric times was an abundance of wood available for heat, cooking, and house construction. In the valley the principal trees were long-leaf mountain cottonwood, walnut, locust, box-elder, alder, and willow. Foremost among the small growths were mesquite, desert willow, and creosote bush. On the surrounding hills grew scrub oak, cedar, and alligator bark juniper. In the mountains, associated with many of the varieties of the lower valley, were large oak, fir, yellow pine, piñon, sycamore, aspen, ash, and wild cherry trees. In the Swarts Ruin no trace of yellow pine timber was found; the charred remains of posts and roof beams were all of cedar or juniper. There was no necessity of going to the mountains for pine when roof beams long enough for the largest house could be cut near at hand.

Fibrous Plants. There is confusion in the local popular names for the fibrous plants. The flowering yucca (*Yucca elata*), with

banana-shaped seed pod, and the sotol (*Dasylirion Wheeleri*), which has a long narrow leaf with small thorns on both edges and a seed stalk resembling that of bear grass, are the two principal varieties. The so-called Spanish bayonet (*Yucca macrocarpa*) and the agave (*Agave Palmeri*) grow in the area, but whether the stiff, thick leaves of these plants produced a satisfactory fiber for textiles is not known. Bear grass (*Nolina microcarpa*), which is abundant on the hills, also furnished a long fiber. Cordage from milkweed, cotton, and yucca fiber was found in a cave near the Swarts Ruin which had been occupied by people of the Mimbres culture. All sandals from this cave were manufactured from the leaves of the flowering yucca. In the lower reaches of the valley near Deming, New Mexico, cotton has successfully been grown in recent years, but higher up in the Mimbres district the nights are too cool.

Vegetal Food. That corn was a crop of major importance to the Mimbres people is evidenced by the finding of carbonized cobs, cobs with kernels attached, and caches of shelled corn in the houses. Cobs from the pueblo ruin and from the above-mentioned cave are all diminutive, running from $\frac{1}{4}$ to $\frac{1}{2}$ of an inch in diameter and $2\frac{1}{4}$ to 5 inches in length. This small cob bore a full round kernel without dent or other irregularities.

No field beans or squash seeds were found either in the Swarts Ruin or in the cave. It is likely that mesquite beans, grass seeds, sweet acorns, piñon, and black walnuts were prepared for food, as well as edible roots and the leaves of the century plant (*Agave Parryi*), which grows on the hillsides farther up the valley. The tender young blossom stalks and the green paw-paw-shaped fruit of the flowering yucca must have added to the diet. For fruits, the prickly pear, wild cherry, and blackberries were to be found in season.

The present-day crops in the valley are highly diversified, the principal ones being alfalfa, corn, beans, chili, green vegetables, fruits, and melons (Plate 4, a).

Animal Food. The bones of the mule deer, prong horn antelope, cotton tail rabbit, and jack rabbit were the most numerous in the accumulation of refuse about the village. Tubular bones were always cracked that the marrow might be extracted. Bones of mountain sheep, elk, and several of bison were found, but not in sufficient numbers to indicate that the meat of these animals was an impor-

tant item of diet. Mountain sheep and elk were doubtless hard to procure. Since the country was settled by whites, elk have been known to come into the state from the north in limited numbers. As residents of New Mexico they became extinct in the early eighties, when settlers killed the remnant of a herd in the Mogollon Mountains, fifty to seventy-five miles northwest of the headwaters of the Mimbres River. The finding at Swarts of buffalo bones is of interest, as it indicates that this animal ranged within the reach of hunting parties, and it may even show that an occasional stray forded the Rio Grande and worked west into this country. That buffalo formerly came at least as far as the east side of the Rio Grande is vouched for by Miss C. M. Cosgrove, a resident of Las Cruces, New Mexico, from 1871-1874, who relates that "One night a half grown buffalo calf came in with our herd of cows." As additional proof that these animals wandered west from the plains country through the mountains, Miss Cosgrove also says that sometime during these years she witnessed, on a fiesta day, "a fight between a buffalo and a bear chained to posts set side by side; the buffalo killed the bear." No mountain lion or bear bones were found at Swarts, but these animals were known to the people and may occasionally have been hunted by them. The decoration of a bowl (Plate 225, *d*) shows a man fighting a bear, and other paintings on bowls (Plates 218, *d*-219, *e*) depict cat-like animals with the long heavy tail of the mountain lion. Drawings on pottery of wolf-like animals suggest the timber wolf, coyote, and fox. Bones of the last two came from the refuse, so it is known that these animals were, on occasion, killed and brought to the village. Bones of the domesticated dog were found, but it could not be determined whether they were from the small or large type of this animal, both of which were found by Guernsey in White Dog Cave.¹ Gophers, prairie dogs, and squirrels were plentiful and were probably eaten.

Among the bird bones are those of the golden eagle, hawk, heron, and crane. Quail and other birds were caught in snares, as shown by the painting on a sherd of a snare set in a runway through the brush (Plate 232, *g*). Dr. Fewkes figures a Mimbres bowl decorated with an Indian setting out snares and catching birds in them.² There is no reason to think that the bones of turkeys would not last in the

¹ Guernsey and Kidder, 1921, *Basket-maker Caves of Northwestern Arizona*, p. 44, Plate 15.

² Fewkes, 1922, *Designs on Prehistoric Pottery from the Mimbres Valley*, p. 27.

soil as well as those of small rabbits, hawks, or herons, but with the exception of one fragment of the tarso-metatarsus of a male bird there was an entire absence of turkey bones, either in the form of artifacts or as refuse. This is difficult to explain. Unquestionably wild turkeys were then at least as numerous as they are now, but for some reason they were not used for food. Many good pictures of turkeys were drawn on Mimbres bowls. There would, accordingly, seem to have been some ceremonial tabu against eating this bird.

Many forms of fish were illustrated on the pottery, but, if they were eaten, none of their fragile bones lasted in the soil. There seems to be no phase of animal or bird life that was not depicted on the pottery, and it is unlikely that many of them were overlooked when it came to a question of sustenance.

We are indebted to Dr. Glover M. Allen of the Museum of Comparative Zoölogy for the following identification of the bone material:

- Mule deer (*Odocoileus hemionus*)
- Prong horn antelope (*Antilocapra americana*)
- Cotton tail rabbit (*Sylvilagus auduboni warreni*)
- Jack rabbit (*Lepus californicus texanus*)
- Mountain sheep (*Ovis canadensis texanus*)
- Elk (*Cervus canadensis*)
- Bison (*Bison americanus*)
- Coyote (*Canis latrans*)
- Fox (*Vulpes macroturus*)
- Domesticated dog
- Golden eagle (*Chrysaëtos*)
- Hawk (*Buteo*) probably Red-tail
- Crane

Preparation of Food. Dry foods were crushed and ground in mortars and on metates, and cooking was done in plain and corrugated pottery vessels, the soot covered exteriors of which show that they were set directly over the fire as well as on the hot coals. No stone pot-rests or similar supports were found in or near any of the fireplaces. In one instance the edge of the lower half of a plain-bottomed, heavy olla had been smoothed, converting it into a bowl in which were placed round stones used for heating liquids (Plate 90, *d*).

Certain moderate sized slabs of laminated tuff with worked edges suggest hot-plates, but, unfortunately, if they had been used for this

purpose, the characteristic surface flaking of this stone has removed all discoloration. The stone-lined warming or cooking compartments, found next to a few of the fireplaces in the Late houses, appear to have some relation to the preparation of food, but their exact use is not known.

THE SITE

General Description. The ruin on the Swarts Ranch is in the N. W. $\frac{1}{4}$ of the S. E. $\frac{1}{4}$ Sec. 35, Town. 18 S., Range 10 W., Grant County, New Mexico. Contrary to the general Southwestern custom of building on high points of land for protection, this small settlement lies in the fertile valley bottom. Nearly all the other ruined towns along the Mimbres are on low gravelly benches above the river, but their position is no way guards them from attack. The excavations can be seen in the center of Plate 3, *b*. The photograph, taken from the west side of the valley, shows the ruin situated in an alfalfa field with an orchard and corn fields on the south. Grass-covered hills appear in the background, and the present course of the Mimbres River is easily traced by the timber along the center of the valley. A former shallow bed of the river, now cultivated as a garden, runs along the east side of the ruin; it is 10 to 12 feet higher than the present flood channel a hundred yards beyond. Formerly there was a marsh north of the ruin, which has been drained and is now part of the alfalfa field.

Water could easily have been diverted by irrigation ditches and put upon the land near the village, but if there ever were prehistoric canals, they have been destroyed by plowing. One hears stories of "Indian *acequias*" from early settlers living in the valley, but today there is no evidence to confirm these reports.

The Ruin. The mound before excavation (Plate 4, *b*) rose 3 to 4 feet above the surrounding fields. Fortunately, because the soil was filled with the stone of fallen walls, it had not been leveled and put under cultivation. No walls were standing above the surface, and only an occasional line of stones was visible in the débris and grass to show a course of masonry of the room below.

The excavations disclosed a total of 172 rooms: 47 scattered Early Period one-room houses, and two groups comprising 125 chambers dating from the final occupation of the site (see ground plan, Plate 238). The cleared buildings occupy a space 268 feet

east and west by 300 feet north and south. Continuing beyond the south end are evidences of several more houses which were not excavated, as the walls had been plowed up and destroyed when an orchard was set out. This adds 50 to 75 feet to the length of the village, of which the long axis lies approximately north and south. The settlement represents an average sized Mimbres community, but in the valley above and below there are a few ruins which occupy two or three times this amount of ground.

Sequence of House Types. On the ground plan (map, Plate 238) it can be seen that the scattered houses of the early settlers, found below the structures of the last occupation and under the large central plaza between the North and South houses, occupy nearly the same terrain as do the surface buildings. The stages of construction were progressive. The earliest type of house was subterranean and is found first, with plaster-on-soil walls and entrance through the roof, as in Room M, and next, as in Room J, with the same wall construction but an improved entrance by way of an incline from the surface. The second stage is the Transitional Period, represented by a pit-house with inclined entrance in which both plaster-on-soil construction and rubble masonry were used (AD). Still later come the rubble walls of the Middle Period (for example Room Y and Plaza W) which were not necessarily subterranean and may only indicate a period of abandonment before the last colony arrived, whose village grew to its present size.

In the San Juan Basin, to the north, the development of house construction was apparently from the Early Basket-maker's supposedly impermanent brush shelters in the open, to the Late Basket-maker's semi-subterranean circular houses with stone slab foundations in caves and open sites, and from these to the rectangular Pueblo buildings of coursed masonry built above ground.

An analogous, although probably not synchronous, developmental series has been found in the Mimbres, consisting of circular rooms formed by posts set in the ground around a shallow depression, and also plastered circular pits sunk into the ground. These did not appear at the Swarts Ruin, but were discovered by the late Wesley Bradfield twenty-three miles up the Mimbres Valley at the Three Circle Ranch. These were succeeded by the rectangular pit-houses at Swarts with their progressive stages of improvement, which in turn led to the one-story house built in the open.

DESCRIPTION OF STRUCTURES

Early Period. The first settlers at Swarts lived in primitive houses entirely subterranean, and without masonry, mere rectangular pits whose earth walls were daubed and smoothed over with mud. These rooms, J, L, M, O, S, Z, AB, AH, and AK, northwest of Room 45, and those below Plaza 13, east of Room 52 and under the west wall of Room 99 (ground plan, Plate 238), were scattered and never arranged around a court or plaza. Some were found below the late houses. The only suggestion of a family group was the cluster of rooms J, L, M, and O. The area AK, traced as far as possible by floor and wall plaster, was 17 feet north and south by 21 feet east and west. The size of the room, with large burned roof timbers and thatch lying on a smooth floor, indicates a covered structure similar to the Council Room, AE, below the North House.

Aside from its crude construction, the age of this first settlement was indicated by the extremely hard fill of packed clay and gravel in some of the rooms. The fill also suggests a considerable period of abandonment. Most of the rooms had suffered from severe fires, as shown by charred roof timbers, burned roof mud, and in some cases by wall plaster fired to the consistency of soft brick.

Contemporaneous with the Early Period plaster-on-soil house are 1 complete room, E, and parts of 2 puddled-adobe-walled houses under Plaza 13; they were also subterranean. The additional thickness of walls in these houses, as well as a strengthening of the east wall of Room J, was the result of a necessary reinforcement to hold back the sliding river gravel into which they were dug, while in the other pit-houses the ground was usually firm enough to stand without such support, and only required a coating of plaster. Brush and stick molds in burned clay show that part of the north wall of E had been strengthened by a reinforcement of sticks set in the adobe. This is the only room of the period showing wattle-and-daub construction.

Three of the 15 houses comprising the first settlement have a door in the east side; 2 were probably entered by an incline from the door to the ground level (destroyed by later building operations); and 1, Room J, had an undestroyed ramp starting outside the door at floor level and extending to the surface; the rest of

these rooms were entered through a hole in the roof. Roofs were made of poles, brush, and grass thatch with a top coating of adobe. Room M (Plate 5, *a*) had at least a 6-foot stud, as the north wall plaster extended to that height above the floor. The houses measured 8×10 to 13×14 feet and only in the large ones, AB and AK, was it necessary to use posts to support long roof timbers. The corners of the rooms were usually slightly rounded and all had vertical sides, except AB, whose walls flared outward 3 inches in 3 feet.

The adobe floors were laid on clay or gravel. In Room J a shallow fire pit was found 2 feet inside the room, opposite the door leading to the inclined passage. In Room AB 2 fire pits and a stone-lined hole between them can be seen (Plate 7, *b*) in a line opposite a bay in the east wall, which seemed to be the remains of an entrance into the room. Beds of ashes were found on some floors, and in 2 rooms were rectangular stone-curbed fireplaces that compared favorably with the fireplaces in the later structures.

Transitional Period. Following the period of plaster-on-soil pit-houses, there appears to have been a time of transition, or at least of improvement in subterranean construction when the new houses had the same general characteristics as the old but were strengthened by the introduction of a certain amount of rubble masonry. Examples are to be seen in Rooms K, U, V, AD, AE, AF, and AG (ground plan, Plate 238). For example, one side of Room AD, two sides of Room K, and all four walls of Room V, were of masonry. The rubble walls themselves did not differ from those of later times. With the exception of the large room, AE, the chambers corresponded in size to those of the preceding period. Some of the corners were rounded and the adobe floors were laid on clay or gravel. In the floors were oblong and round plastered fire pits, as well as square rock-lined fireplaces.

A noticeable resemblance to one type of Early house construction was seen in the inclined passages to doors entering four of the Transitional rooms. In two of these cases the door and passage were on the east side; in two, on the south. The stone walls of the east side and entrance to Room AD (Plate 5, *b*, and Plate 6) played the same rôle as the puddled adobe construction in Early Room J. The north, south, and west sides of AD were smooth plaster-on-soil. The fill of the room was very hard. The floor was laid on clay and gravel, and in it, directly opposite the 18-inch door, was an adobe-lined fire pit.

10 THE SWARTS RUIN: A TYPICAL MIMBRES SITE

The plastered floor of the passage of AD had two stone steps with risers of 6 and 10 inches. No steps were found in the sloping passage of Room J. A 2½-inch post, set vertically, had been partially imbedded in the casing of the door into Room AD.

In this period, as in the preceding, the rectangular underground houses with sloping entrances were not grouped to face a common court, as were some of the pit-houses discovered by Wesley Bradfield at a ruin excavated by him on Cameron Creek, west of the Mimbres Valley.¹

The large room, AE, is worthy of detailed description. It was 31 feet wide, 39 feet long on the east, and 37 feet on the west side. The floor at the south end lay 5½ feet below the floor of the Late Room 32. In wall construction it combined features both of the Early and of the improved Transitional pit-houses. It doubtless belongs to the latter phase, because in the east half of the south wall and in the southwest corner there was coursed masonry, its only occurrence at Swarts. Where the flat pieces of limestone were found is not known but their use shows that after rubble masonry was once evolved, the builders were quick to improve their methods and would have continued to do so if more of this kind of building rock had been available. The rest of the room-walls were of adobe plastered on the sides of the excavation. On removing the mud wall-coating at the north end of the east wall, there was discovered a lower course, 12 feet in length, of slabs set on edge. This "slab-house" construction was presumably due to the necessity of holding back loose gravel that could not be kept in place by plaster alone. All the wall plaster was well smoothed and the southeast and southwest corners of the room were decidedly rounded. There was an excellent floor over the entire room, covered by a layer of packed charcoal, 1 to 1½ inches thick, composed of burned rush thatch and roof timbers, the combustion of which had reddened the floor in places to a depth of 4 inches. Charred posts were found set in the north and west walls and irregularly spaced in the floor. These, with the burned roof material, indicate that the whole room had been under cover. A fire pit 3½ feet in diameter was located in the center of the room near the east side, and on the floor were two crude flat metates and an early type mano. This large room is unusual, as the rooms of the Early settlement were normally of moder-

¹ Bradfield, 1927, *Notes on Mimbres Culture*, p. 554.

ate size. Therefore, it probably should be classed as a communal chamber which, like the first period house, AK, would have accommodated a large gathering of people; the same is true of Rooms 76 and 114 in the later village.

There may have been no great lapse of time between these Transitional Period structures and the so-called Early Period houses, from which they seem to be derived. All were set deep in the ground, some into river gravel. The burning of Room AE may indicate abandonment, and in some of the rooms hard packed fills of red clay and gravel washed from the hillside to the west may also point to a removal caused by a cloudburst. Between the Early and Transitional Periods and later times a certain interval must surely have elapsed to permit the accumulation of the considerable deposit of black soil on which the Middle and Late Period houses of the village were built.

Middle Period. The third, or Middle Period, of our series comprises structures with rubble walls and some with outside doors, a decided improvement over the deep pit-house type. Some were partially subterranean without incline from door, and others were built at the ground level of their time, but all lay below the last occupation of the village. Under North House they were scattered, but more closely grouped below South House. Below North House were 10: the completely outlined Rooms X, Y, and W (which is practically enclosed) and the remains of 7 others below Rooms 63, 64, 81, 87, 88, 92, and 93. Underneath South House were 15, of which 2A, C, D, F, H, R, and T were complete. The incomplete Rooms G and P and the Early walls east of 2A and T and below the Late Rooms 13, 17, 18, and 38 complete the count.

With the exception of the walled enclosure, W, and the large room, Y, the rectangular rooms of this period varied in size from 7×9 to 13×14 feet. Their walls, as has been stated, were of rubble, and in some instances so few rocks had been used that they were, to all intents and purposes, of puddled adobe. Roofs of beams, brush, thatch, and mud were found here as elsewhere throughout the entire ruin. Where necessary, supporting posts were set in the floor.

Doors with plastered and rounded casings were found in the east walls of 2 rooms, T (Plate 8, b) and Y (Plate 9, b). The rounded corner of one casing of the door of T showed, on its in-room side, the

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semicircular impression of a 2-inch upright post. In the floor of T was a fire pit; in Y a rough fireplace was situated opposite the doorway. Rectangular rock-lined fireplaces, as well made as those of later times, were found in the adobe floors of other rooms. Walls were plastered with adobe and the rooms possessed no unusual features, except D, which had in one corner a thin stone shelf set in the wall 10 inches above the floor.

Room H (Plate 8, a), being closely linked by party walls to other rooms of this time, is considered to have belonged to the Middle Period, even though its east wall was plaster-on-soil and very few rocks were used in the north and west sides, characteristics which would otherwise place it in the Transitional Period. The fill of the room was extremely hard. The walls stand $3\frac{1}{2}$ to 4 feet, with an outward pitch of 4 to 6 inches in that height; the purpose of this batter, which also occurred in Pit-room AB, is not clear.

Room Y (Plate 9, a), 12 feet wide, $18\frac{1}{2}$ feet on the east, and $17\frac{1}{2}$ feet on the west, lay below the six Late rooms, 54-59. It is larger than the other houses of the Middle Period and, with T, is one of the two which were not entered through a trap in the roof. Its walls could hardly be called rubble as they consisted mostly of adobe, with an occasional boulder for reinforcement. The floor and walls were plastered and the southwest corner was quite rounded; the very hard fill of the room extended $1\frac{1}{2}$ feet above the floor. A door, 2 feet wide, with rounded adobe-plastered jambs, could be seen in the east wall. A flat stone slab to be used as a threshold was set in adobe $1\frac{1}{2}$ feet above the floor. There was a rectangular fireplace lined with rough rocks 20 inches inside the room opposite the door. Near the center of the room and in line with the fireplace and door was an adobe-lined pit 14 inches in diameter, dug $2\frac{1}{2}$ feet into the clay and gravel. Its purpose is problematical, but it resembled the rock-lined hole between the fireplaces opposite the door of Pit-room AB.

Save for a break in its east boundary, the walled enclosure, W, (see ground plan, Plate 238), resembles Plaza 13 on the southeast corner of South House. However, a smoothed adobe floor covered the entire area, parts of the south and west walls were plastered, and there was an alignment of three 8-inch to 10-inch posts running lengthwise through the center. These features, together with burned timbers, layers of charred *tule* thatch, and a fireplace near

the center, indicate a covered structure rather than an open plaza. This unusually large room, $22\frac{1}{2} \times 38$ feet, definitely belongs to the Middle Period, since its floor was above that of AB and below those of Late houses. It must have been built after Room Y was abandoned, since its west wall stood within $2\frac{1}{2}$ feet of the door of Room Y. Because of its size, this room, whether partially or wholly covered, should doubtless be placed in the category of communal houses.

Summing up the conditions observed in the remains of the first three periods, one may infer, from the evidences of burning, and particularly from the flood-deposited clay and gravel fills in many of the rooms, that they stood abandoned for a certain length of time before the houses of the Late occupation were built upon their ruins.

Late Period. For convenience, the two groups of one-story buildings in the Late occupation of the village are referred to as "North House" and "South House." Although they may not have been exactly contemporaneous, they are discussed together, because both in architecture and in evidences of living conditions they were more or less alike. Both of the groups were fairly compact and had no outlying rooms. Neither cluster was laid out to follow a preconceived plan, and a jumbled condition resulted from the addition of rooms necessary to accommodate increases in population. The stages of growth cannot be determined by study of the masonry since the great amount of adobe used in the walls was uniform in color and Late walls fused into the Early ones with no observable demarcation. Walls of the Early and Middle Periods underlay a considerable portion of the last village, refuse of those times being scattered all about them. For this reason an attempt to trace the addition of rooms founded on ashes and rubbish failed to determine definitely the nuclei from which the two clusters of buildings started. Consideration of burials below walls, of shallow burials in rooms, and of burials on floors and in room fills threw little additional light on the problem. The only obtainable evidence of growth was a faint indication of a cluster of possibly nuclear houses around Room 72 in North House and of two others in South House, around Rooms 11 and 28. The unusually heavy masonry in the east and south wings of North House seems to indicate the late addition of larger and more symmetrical rooms in those quarters.

The addition of larger but not thicker-walled rooms at the south end of South House also suggests a growth in that direction.

South House differed from its northern neighbor in that it had a walled plaza and at least two inner courts. The walled plaza, numbered 13, adjoined the building. At the time of excavation its walls stood 1 foot 6 inches high on the east and south sides. There was a second open plaza, numbered 44, to the east of it. The court, numbered 113, was surrounded by houses and the east end of Room 60, north of 113, was another open-air enclosure connected by a passage with 113. None of these plazas and courts were roofed.

North House possessed no walled plazas or inner courts, out-door work undoubtedly having been carried on around all sides of the buildings. The opening between the two groups, which faced east, appeared to have been a large dance plaza, as there was a stratum of packed soil, 12 to 14 inches below the pre-excavation surface, over nearly all this area.

The rooms in both house clusters were more or less rectangular; a third were approximately square, the rest oblong. Leaving out of account some of the large peripheral rooms, the houses were from 9 to 12 feet square, those which were oblong varying from 6×8 to 12×16 feet (inside dimensions). Eight rooms in the two buildings had fallen temporarily into disuse, and later the accumulated fill which covered their floors and fireplaces had been leveled and a second floor laid upon it. Two floor levels were found in Room 72, and a third floor was laid over the north half of the room where a cross-wall had been built to form the Late Room 79. Rooms N and 77 in later times were built in the corners of two earlier rooms.

Masonry. The fact that there was no stratified rock formation in the immediate vicinity necessitated the use of river boulders for building houses. The resulting walls were of very coarse rubble, since the difficulty of holding the rounded stones in place had called for the use of a great amount of adobe. A 6-foot section of the north wall of Room 97 was made of wattle-and-daub. It was one of two instances of this construction in the ruin, the other being in the Early Period house, E. In the present case it was probably due to the repair of a fallen wall, since there was evidence that the east wall of the room had become weakened, necessitating a rubble reinforcement. Usually a course of the heavier and more flattened rocks was laid as a foundation. The average wall was 8 to 10 inches

thick, but in some of the additions to North House they were 24 inches through. Walls stood from 1 foot 3 inches to 3 feet 8 inches in height and in no instance was there a sufficient accumulation of building stone, or more than one layer of fallen roof débris, to indicate a two-story construction. There are no data as to the original stud of the Late rooms; the only case, indeed, in the whole ruin where such evidence is available is in the Early Pit-room M (Plate 5, a) which showed plastering 6 feet above the floor.

Roofs. Most of the houses of all periods had been destroyed by fire, and lying on the floors of many rooms were charred posts and roof timbers. The roof beams varied in size according to the width to be spanned; judging from the remains, some of them had been 6 to 8 inches in diameter. Roofs were made by laying brush, grass thatch, and adobe over the beams. They resembled the flat roofs of the present day Pueblo and Mexican houses, but were not as well constructed.

In Late Room 34, by carefully tracing the lines of charred beams on the floor, the roof construction could clearly be discerned. Five large *vigas* spanned the room. The spaces formed by these were as follows: 3 feet 6 inches, 2 feet 6 inches, 2 feet 6 inches, 4 feet 6 inches, 4 feet 6 inches, and 3 feet. Layers of burned rushes and coarse grass lay on top of the beams and on the floor between them. Above this was a 6-inch to 8-inch layer of hard adobe. Impressions of cross-laid sticks, which must, of course, have been present as supports for the thatch and mud above the wide-spaced beams, were not found on the under side of the fallen roof adobe. This is accounted for by the fact that the sticks had been separated from the mud coating by the layer of grass, which prevented their impressions from being left in the soft clay when it was spread on top of the thatch. The same type of roof construction seems to have held throughout the ruin, since the underside of the mud coating always bore the impressions of grass and reeds with only an occasional mark of brush. Unfortunately, the location and size of the trap door in the roof of Room 34 could not be determined.

Posts. The stumps of roof posts found in floors vary in diameter according to the size of the room. Some were as small as 3 inches, while one of the three large centrally-aligned posts in Room 76 measured 15 inches in diameter; all were sunk 4 feet below the floor. Single posts, rows of 2 and 3 and, as in Room 62 (Plate

10, α), 4 posts forming a square, supported the roof. In some cases posts were set at irregular intervals in a room or against its walls, probably to hold up a sagging or decayed roof timber.

In Room 62, and in two other rooms of the Late Period, 4 posts were utilized, all of which were placed 3 to 6 feet away from the walls and corners. Possibly this arrangement served to do away with long beams and to allow the use of shorter poles reaching from the walls to a framework resting on the posts. Since these three rooms were incorporated in house clusters of the last occupation, which contained single roof supports as well as rows through the centers of the houses, it seems that the rectangular setting of the posts could in no way be construed as a sufficient support for a roof independent of the side-wall masonry. Many houses at Swarts were without roof posts, and of necessity the burned *vigas* found on the floors must have originally rested on the rubble walls. Wesley Bradfield at Cameron Creek discovered houses with large corner posts and small intermediate posts supporting the roofs of buildings that did not have stone walls.¹ He states that a large post was always found in the center of the floor area. He identifies as belonging to a later phase rooms sunk deeper into the gravel, with sloping passages from the ground level walled with small poles. This type of house had rubble walls built from the edge of the pit to the roof. At the Swarts Ruin and at other sites excavated by us the arrangement of posts was never found to follow a fixed rule, since the size of the room and the strength of roof timbers and walls would often necessitate the placing of supports at irregular intervals. It was evident that considerable care had been taken in setting many of the deeply-planted posts, their ends, in such cases, resting on a flat stone or a piece of broken metate and their buried parts grouted with rocks and puddled adobe.

In the floors were no stubs of small timbers arranged in such a manner as to suggest the remains of loom frames. Neither was there a hole in any floor with a wooden cross-bar at the bottom which might have served to anchor a loom hung from the ceiling.

Plaster. Care was taken in pointing walls and in applying a smooth coat of mud plaster on the insides of the rooms. In some rooms several coats could be seen, but in no instance was there evi-

¹ Bradfield, 1927, *Notes on Mimbres Culture*, p. 352.

dence of frescoing or painting (Plate 10, *b*). No smoothed plaster was noted on the outsides of houses, although the adobe of the walls had probably been more or less smoothed.

Floors. Floors of all periods were of puddled adobe, 1 to 2 inches thick. Where they had not been injured by surface water they were very smooth and showed no cracks. Possibly wood ash was mixed with the mud to prevent checking when it dried (Plate 13).

Certain innovations in floor construction appeared during Late times. The west half of Room 23, in South House, was paved with stones under an adobe coating. In North House there were three such rooms. The floor of Room 32 was first paved with small cobbles, over which was spread a smooth surfacing of mud. Around the walls of Room 72 was a baseboard of vertical stone slabs 10 to 12 inches wide. This was set below the floor, which consisted of a hard coating of mud over a grouting of boulders and adobe 8 inches thick. Room 36 (Plate 11, *a*) also had an unusual floor of smoothed adobe over tightly laid flagstones, below which was a 6-inch layer of small rubble set in adobe. There were no fireplaces in the secondary floors of Rooms 36 and 72, but below the grouting were adobe floors with fireplaces. This indicates the primary use of these rooms as dwellings, after which they were changed into store rooms, with a type of floor which would prevent rodents from burrowing through and destroying supplies of corn and other foods.

Doorways. Outer doorways, though occurring in some of the Early and Middle Period houses, are not found in the Late Period when all doors occurred in partitions between rooms (Plate 12). Even of these only 6 were found, all in North House. This proves that rooms normally were entered through the roof and explains the use as trap-door coverings of numbers of large, thin, worked slabs of laminated tuff found lying on many room floors. One is shown on Plate 13, *b*. Absence of doors in the outer walls seems to indicate a necessity for protection from troublesome neighbors in later times. The doorways between rooms are from 14 to 24 inches wide with rounded adobe-plastered casings, which in one instance stood 24 inches high. No lintels were found in place since all the openings reached ground level. In three rooms, as an indication of door height, stone slabs, 24 inches long, were found leaning against the wall or lying on the floor in front of the doorways. These stones

had undoubtedly been used to close the openings. All doors had flat stone slabs for sills, which stood 3 to 7 inches above the floor level.

Windows. North House shows still another advance over South House in minor architectural features by having 8 small openings in party walls between rooms, similar to those in Room 68A (Plate 11, *b*). These were 7 to 14 inches wide and 9 to 15 inches high: 3 were at floor level and the rest from 4 to 15 inches above; 3 had flat stone casings; the sides of the others were rounded and plastered. All had stone lintels, 6 being also furnished with stone slab sills. Those above the floor might be called windows through which small articles could be passed, but the 3 which were flush with the floor seem to indicate a ventilating system for forcing smoke out of the rooms through the trap-doors in the roofs. The placing of these openings in relation to fireplaces and beds of ashes on the floors seems to confirm the idea. In one room an ash bed was opposite and close to an opening; in another case there was a bed of ashes in one room and a fireplace in the adjoining room, with the opening in the wall between them; and in three others fireplaces were close to and directly opposite one of these inside openings (Plate 13, *a*). For some reason 3 of the vents had been sealed with flat stones and adobe.

Cupboards. Three cupboards or niches sealed at the back with adobe or flat stones were found in North House, one in South House. In size they are similar to the inside windows. Three were at floor level, two of them opposite fireplaces, which might indicate that they originally passed through the wall to serve as ventilators. No cupboards were found in Early houses.

Shelves and Benches. The few shelves and benches were confined to North House. In one room a stone slab was set in the wall to form a shelf 6 inches wide by 22 inches long. In Room 68, two 4-inch adobe pilasters, 3 feet apart, were found against the wall; they stood 21 inches above the floor. There was an impression of a 2-inch post in the front of each pilaster. These pilasters are similar to a pair found at Treasure Hill, another Mimbres ruin, which supported a stone shelf set in the wall. In Room 68, however, the shelf had disappeared.

No benches of a size suitable for bunks were found at Swarts. Against the walls and resting on the floors in Rooms 51 and 53 were

low narrow shelf-like offsets 10 to 12 inches high, 6 inches wide and 20 and 36 inches long respectively. They were faced with flat stones and filled with adobe. In Room 35 (Plate 13, *b*) there were two real benches set against the walls. As they were 12 inches high and measured 14×24 and 11×17 inches, they could have been used as seats. Both were faced with stone slabs and filled with adobe and rocks. One, which was packed with adobe and flat stones, may have been a storage bin, later solidly filled to convert it into a seat. None appeared in Early houses.

Storage Bins. Bins for storage, a development of the Late Period, were equally divided between North House and South House. In Rooms 6 and 14, the remains of adobe and rock-walled bins stood 4 to 6 inches above the floor; their inside measurements were 18×24 and 24×30 inches respectively. In Room 17 and Room 78 small bins, 6×12 and 12×12 inches, were formed by setting two stone slabs upright in the floor against the wall. In Room B, the first occupation of Room 24, was a bin $16 \times 30 \times 6$ inches deep, set into the floor with the ends, sides, and bottom lined with thin sandstone slabs (Plate 14, *a*).

In North House three more elaborate bins were discovered in the northwest corner of 68A, so numbered to indicate a primary floor level in Room 68 (Plate 11, *b* and Plate 14, *b*). The bins were 12 inches deep with stone sides standing 4 inches above the floor. The large bin directly in the corner measured 22×36 inches and the combined size of the two small stone-covered bins at its east end was 10×18 inches. The floor of the large bin was smooth adobe and its roof was of stick and grass thatch, then adobe, and above this stone slabs, all supported by small poles. These were the only covered bins in the village.

Fireplaces. Many houses had fireplaces, as can be seen in the views of typical Late Period rooms (Plates 12 and 13). In others ashes and burned areas were found on floors, the product, perhaps, of fires built to heat sleeping quarters.

All living room fireplaces were sunk into the floor; most of them were rectangular and lined with flat stones set on edge, their tops usually flush with the floor, or slightly above it. There are 3 types: the single, the oblong with a stone division, and the double, the latter being a combination of two nearly square fireplaces set close together. Rectangular curbed fireplaces were from 3 to 12

inches deep. There was no standard size; some were 12 to 24 inches square, while oblong fireplaces were of varying widths, and up to 30 inches in length. In Room 68A (Plate 14, b) was found a peculiar double fireplace having two and three courses of flat stones set on edge around the sides and one end. Occasionally a circular depression in the floor was roughly outlined with rocks, and in a few rooms were smooth adobe-lined fire pits, 8' to 10 inches in diameter. A fire pit in Room 98 (Plate 15, a) had a raised adobe curb.

In Rooms 98 and 109, at the north end of North House, were fireplaces which had, close beside them, small rectangular stone-lined boxes, which would have become heated and which seemed to have been used as a kind of oven, or warming closet. These boxes never contained ashes as did the adjoining fireplaces. Plate 15, a, gives a close view of such a box and fireplace in Room 98; another appears in the general view of Room 109 (Plate 12, b).

In Room 86 (Plate 13, a) a double fireplace is seen close before an opening at floor level into the next room. The relation of fireplaces to these openings in walls has already been mentioned and the suggestion made that the combination might have served to create a draught from an adjoining room, thus driving out smoke.

No variety of fireplace could be recognized as typical of any given house form. Bradfield segregates the pit-room having a sloping entrance and shallow fire pit with a large stone set in the side next to the door.¹ Only one such Early room at Swarts possessed this sort of fire pit; other similar rooms of the same period, and those of the succeeding Transitional Period, contained circular and rectangular adobe-lined pits as well as thin stone-curbed fireplaces. Crude fire pits were found in some of the houses of all periods.

Stone Platforms. In Plazas 13 and 44, adjoining South House, were stone platforms, the use of which is extremely puzzling. On the east side of Plaza 13 were 5 platforms of different sizes, and across the wall to the east, in Plaza 44, were 2 more. They were built of various sized stones, so set in adobe as to be raised from 5 to 7 inches above the plaza floors. Beginning at the north side of Plaza 13 (Plate 15, b, photograph to south) the nearly circular platform, 1, was 6½ feet in diameter; Platform 2, at left, also of rather large stones, was 2½ feet in diameter; Platform 3, of medium-sized

¹ Bradfield, 1931, *Cameron Creek Village*, p. 17.

stones, was 3 feet in diameter; and Platform 4, 3 feet in diameter, was paved with flat stones outlined with rounded rocks. Platform 5, $2\frac{1}{2}$ feet in diameter, was saucer-shaped with a flaring rim of flat stones and with thin stone fragments laid in the bottom.

In Plaza 44 was a 4×5 foot rectangular platform made up of river stones, and near this was a 4-foot circular platform paved with thin flat stones, encircled by large round rocks and five flat stones, set at an angle to form a shallow basin. A circular platform, $2\frac{1}{2}$ feet in diameter, was built in the opening between the inner courts, 60 and 113, and another, $2\frac{1}{2}$ feet in diameter, was found outside and against the north wall of Room 53 in North House.

There were no ashes or other trace of burning on the tops of any of the platforms although in Plaza 44 there was a fire pit, and in 13 a curbed fireplace as well as beds of ashes. The platforms were close to the surface, and if they had ever been plastered, the roots of the heavy coarse grass (*sacaton*) growing all over the ruin have since destroyed the mud coating. As all but two were rather small, and two were saucer-shaped, they would not seem to have been practical for threshing, nor would it appear necessary to have built an elevated platform for such a purpose when the smooth adobe floor of the plaza would have served equally well. As a protection from the sun when work was being done in the open, four posts to support brush were set in a square on the floor of Plaza 13. This shelter overlapped the southern half of Platform 1, and in the afternoon would have shaded Platforms 2 and 3.

A fairly wide distribution of similar flat, cobbled platforms and small, shallow, slab-lined pits is becoming apparent, although their use is still uncertain. The authors observed stone-lined "saucers" at a ruin in Burro Cienega, near the southern end of the Burro Mountains, northeast of Lordsburg, New Mexico. Both platforms and "saucers" were seen in the southern end of Hidalgo County, nine and a half miles north of the Mexican border at Brushy Creek Ruin in the Playas Valley. Sauer and Brand report three sites in the Chiricahua mountains of southeastern Arizona which contained small outlines referred to as "stone rings" and "circular structures," generally lined with rock slabs. They suggest their use as roasting pits, and E. J. Hands, who collaborated with them in their reconnaissance, calls them "circular storage rooms," by which we suppose he means the foundations of small granaries presumably at

one time walled with adobe which has since melted away.¹ The latter suggestion appears reasonable in a postulated restoration of a building resting on a flat platform but does not seem to apply to the shallow saucer-like basins.

Communal Rooms. In each group of buildings there was a room so much larger than the surrounding houses that it seemed to be a communal chamber for gatherings or councils. Room 76 in North House measured 23×29 feet and Room 114 in South House 19×21 feet. Both had been roofed. The 3 roof-support posts set in the median longitudinal axis of Room 76 were 12 to 15 inches in diameter and were sunk 4 feet below the floor in rock-lined holes. Room 114 had 2 smaller roof posts set across the room. Each room had 2 fire pits, but there was no other evidence of use as living quarters. The Rooms AK, of the Early Period, and AE, of the Transitional Period, similar to these, have already been described (pp. 8 and 10).

Kivas. In this village there were no true kivas. The room indicated on the map as 7-15, the only one of its kind found, is a kiva-like room in that it possessed an outside shaft, with a sub-floor air passage leading to a party fireplace in the wall between it and the small Room 6 on the east. The room is L-shaped, $16\frac{1}{2}$ feet long east and west and $11\frac{1}{2}$ feet on the east side (Plates 16 and 17). The vertical ventilating shaft was $1\frac{1}{2}$ feet outside the north wall and 6 feet from the line of the east wall. It was 18 inches in diameter, $3\frac{1}{2}$ feet deep, and was smoothly walled with large rocks. At the bottom of the shaft an opening 8 inches wide and 9 inches high, lined on top and sides with flat stones, extended under the wall of the room (Section X-X Plate 17). The top of the opening was flush with the room floor. After entering the room, the sub-floor passage widened to 12 inches, maintaining a depth of 9 inches and, in a sweeping curve to the east, ran into a fireplace near the south end of the wall between Room 7-15 and Room 6. It was lined with stone slabs on the sides and top and had a dirt floor. The roof stones had slid into the passage.

The fireplace, at the end of the tunnel, was 12 inches square and 10 inches deep. Two large, thin stone slabs, set on edge in the wall between Rooms 6 and 7-15, formed its north and south curbing and extended from the bottom of the fireplace to 12 inches above

¹ *Sauer and Brand, 1930. Pueblo Sites in Southeastern Arizona*, pp. 435, 439, 440.

the two equally level room floors. The fireplace was full of white ash.

It is difficult to see how a fireplace built in a partition wall could be practical. One explanation may be that the wall did not extend to the ceiling, but served as a bench or low screen between the two rooms. It has also been suggested that this wall may have been built over the fireplace in late times without disturbing its tall rock curbs. If so, Rooms 7-15 and 6 must formerly have been one.

The writer describes two rectangular kiva-like rooms found at Treasure Hill,¹ and Bradfield later discovered four similar rooms at Cameron Creek,² both Mimbres sites west of the Santa Rita Mountains in the Silver City-Fort Bayard part of the area. Each one of these rooms had an exterior shaft and an opening through the wall into the room at floor level, opposite the fireplace, but without a screen or deflector between it and the fireplace. The outer shaft and the opening into Room 7-15 at Swarts resembles this arrangement, but the position of the fireplace seems to have necessitated a more elaborate method of air distribution through the sub-floor air duct.

BURIAL CUSTOMS

With the Mimbresños disposal of the dead was a sacred rite. The same mortuary practices held throughout all periods of occupation at Swarts, as well as at other sites excavated by the writers and at Mimbres ruins observed by them while work was being done.

Location. In locating skeletons all measurements were taken from the skull for depth and distance from survey stakes, or from room walls, which in this case was simple since the greater proportion of the 1009 skeletons recorded were below the floors of houses.

Intramural Burials. Our conclusion that house burial was the normal custom at Swarts is based upon the fact that most skeletons were found near, but seldom under the walls. In other words, the graves followed the outlines of the rooms, thus avoiding the breaking of the fireplaces, which were usually situated near the center. This avoidance of fireplaces indicates that the houses continued to be occupied after interments had been made below their floors (see burial map, Plate 239). The Mimbresños seemingly had no superstitious fear of their dead; they even desired, apparently, to be near

¹ Coegrove, 1923, *Two Kivas at Treasure Hill*, pp. 18-21.

² Bradfield, 1927, *Notes on Mimbres Culture*, p. 653.

them and to guard them. Some rooms contained no graves, others had 1 or 2, and some had as many as 10 to 32 burials below the floors. Unsanitary as this practice might seem, its disagreeable features, if noticed, were reduced to a certain extent by interring adults well below the floor level. Infants were sometimes placed barely under the floor, but probably the soil quickly absorbed their small bodies and the heavy adobe coating sealed them tightly in. Due to the homogeneity of the soil beneath the rooms and the use of the same earth as floor plastering, only one case was discovered in which a floor had been broken for a grave and a distinct line of repair in the coating could be seen.

Outlying Burials. Ninety-eight graves were found outside buildings, showing that the custom of intramural burial was not invariably followed. In the house clusters, 27 skeletons were below walls, and 43 adult bodies lay so close below the floors of rooms as to indicate that they were originally outlying burials over which houses had later been built. Most of the outside burials lay in the space between North House and South House. There was no apparent lack of mortuary offerings with these bodies, nor were they different from those accompanying burials below house floors. Hence, it cannot be said that the people who were not buried in houses were held in less esteem by the living.

Burials in Room Fills. Nineteen burials came from the fill of rooms which probably had fallen into disuse as the population decreased before the final abandonment of the village. Only 18½ % of the total numbers of graves at the Swarts Ruin were outside the houses and in room fills. This is strongly at variance with the conditions observed by Bradfield at his Cameron Creek site, at which place he states that most of the graves were outlying and that the percentage of bona fide intramural burials was very small.¹

That the custom of burying under houses at Swarts may have been discontinued in Late times and bodies disposed of elsewhere, possibly in abandoned houses or in the open, is suggested by the scarcity of interments in the south ends of both North House and South House, where, it will be remembered, large regular and apparently Late additions had been made (burial map, Plate 239). However, since the Swarts burial map, in most instances, shows that bodies were strictly confined within the walls of rooms, and

¹ Bradfield, 1927, *Notes on Mimbres Culture*, p. 557.

since the writers found a like condition existing at several other sites, they are convinced that the prevailing custom in the Mimbres area was to secrete the dead below floors and keep them under a roof.

Disturbed Burials. The result of floods during the early settlement of the village, the excavating and building of houses, and the disturbance caused by later interments in rooms already thickly tenanted with the dead, led to the scattering of human bones through the soil. Many bodies were found strangely dismembered. Rodents did some of the damage, particularly in the case of infants which, accordingly, were not counted in compiling the list of 160 disturbed graves. Eleven were secondary burials, with the bones and offerings of pottery set to one side when a later grave was dug. These can hardly be termed bundle burials, as the bones never seem to have been arranged in any order. Post holes were sunk through 7 skeletons, and an occasional body had been decapitated by the sinking of a floor to a lower level. Lone skulls with bowls over or near them could be explained only as reburials of disturbed heads, or, if found along the east side of the ruin, as the work of river floods which had washed away the rest of the body. If these were the heads of enemies, it does not seem probable that pottery would have been placed with them. Decapitation must occasionally have been practiced, as this form of sacrifice is depicted on a bowl found in the Mimbres Valley by Earl H. Morris in 1926, and another Mimbres bowl with an almost duplicate decoration is illustrated by Fewkes.¹

Evidence of Violent Death. There was but one case indicating violent death, and this was evidently caused by the burning of a house. After the fire, the partly charred bones were not dug out of the refuse and buried in the customary manner. Lying on the floor of Room 63, there was another body without mortuary offerings, whose position did not seem to be that of a regular interment (Plate 24, a).

Form and Description of Graves. *Cremation.* Cremations occurred sparingly in the Mimbres area; 6 were uncovered at Swarts. All but one were the remains of adult bodies, the broken and calcined bones, mixed with particles of charcoal, having been scraped up and interred with pottery offerings of 1 to 4 killed or unkill-

¹ Fewkes, 1923, *Designs on Prehistoric Pottery from the Mimbres Valley*, p. 29.

bowls. As no crematory altars were found, it is presumed that the bodies were burned in the open plaza between North and South houses, where burned soil and beds of ashes were discovered. The 5 following listed burials were outside the buildings in this plaza area, all in shallow graves from 1 to 2 feet below the surface.

Burial 365: 1 foot below surface; 1 killed Mimbres Classic, geometric design bowl (Plate 162, *b*) inverted over the bones.

Burial 604: 1 foot 6 inches below surface; half a killed plain red-washed bowl inverted over the bones.

Burial 467: 2 feet below the surface; 2 killed Mimbres Classic bowls set upright in the soil; one a geometric design bowl (Plate 128, *d*) containing the bones, the other a naturalistic decorated bowl (Plate 229, *a*) placed on top of it.

Burial 367: 1 foot below surface; 1 unkilld Mimbres Classic geometric design bowl (Plate 127, *a*) inverted over the bones.

Burial 371: 1 foot below the surface; 3 unkilld geometric and 1 Mimbres Bold-face naturalistic design bowls nested and inverted over the bones (geometric design bowls shown on Plate 115, *d* and *e*, and Plate 117, *c*; naturalistic design bowl shown on Plate 120, *d*).

The sixth cremation (Plate 18, *a* and *b*) was in the fill of a Late room. The bones were in an olla of El Paso polychrome, a ware characteristic of the Alamogordo district, northeast of El Paso, Texas. Inverted over the olla neck were nested two Tularosa polished black interior bowls, with fillet rim decoration on the exterior, from the San Francisco River, northwest of the Mimbres. The bowl immediately over the olla was killed. The presence with this cremation of specimens of two such widely separated types of intrusive pottery is hard to explain.

Position of Bodies (Plates 19 and 20). The burials showed care in placing the bodies, which were usually semi-flexed or closely flexed on back or side. There was no uniformity as to the placing of arms and hands. At times, one hand would be on the chest with the other arm parallel to the body, and at others, both hands would rest on the body. Occasionally a forearm or hand would lie over the skull. Several skeletons rested in reclining and seated positions. Excluding infants, there was only one body lying at length, that of a woman accompanied by a Mimbres Classic bowl. Three adult bodies had been dropped face down into pits, but some respect at least had been shown by placing a bowl over the skull of one, and

by inverting a bowl over the pelvis of another. It was evident that no thought had been given to the orientation of bodies, as they were found headed toward all points of the compass.

Protection of Graves. To prevent disturbance of graves, rocks and slabs of tuff, some with retouched edges and rounded corners, were laid over bodies. As an additional protection, puddled adobe or rocks set in adobe were found over some skeletons, and in one burial the body had been packed in mud.

Size of Graves. Grave pits were barely large enough in adult burials to accommodate the flexed body. Possibly a desire to return the departed to the earth in the embryonic position may have led to the digging of such small graves, but the saving of labor and the need to economize space where so many bodies were buried in houses may have had something to do with it. With the single exception of a Late infant burial which was covered with a Little Colorado black-on-red bowl (St. Johns Polychrome¹) and placed in a small cist of flat stones, there were no rock-lined graves here, nor so far as the writers know, have they been found in other parts of the Mimbres country. The walls of one grave at Swarts were plastered with adobe.

Ashes and Charcoal in Graves. There seems to be evidence that ashes and charcoal symbolized mourning, as occasionally a skull would rest upon or be covered by wood ash, while ashes were often thrown into the grave fill. Charred *tule* was found between a bowl and skull, on top of a bowl over a skull, and in one grave a bowl containing charcoal was inverted over the head of a seated skeleton.

Mortuary Offerings. Food. Placing food with the dead was not common. The only evidence of such a custom was the finding of charred corn with 2 children and below the body of 1 adult; and in another grave of an adult a bowl contained a decayed granular substance having the appearance of corn meal.

Stone. Useful articles of stone were placed in adult graves; metates, manos, rubbing stones, hammer stones, and, in one case, a large milling mortar. Broken metates were sometimes thrown into the fill of the graves of males. In each case of 10 burials of women, a perfect metate with 1 to 3 manos was laid over the body. One woman had 2 metates and the metate with another woman had

¹ The Medallion, 1931, *Some Southwestern Pottery Types*, p. 36.

been killed by means of holes pecked in the grinding surface. (Plate 21, b).

Potter's Tools. Potter's tools might well have been expected with burials, but only 4 graves with such deposits were found; 2 with a single polishing stone, and 2 with a single scraper made from a sherd.

Pottery. Usually adults and children shared equally in the number of offerings of pottery, but in a few cases adult graves were richer than those of the children. Numbers of graves of old persons and some of those of infants contained no pottery. The prevailing custom, so nearly universal in the Mimbres country that it must have had some religious significance, was to invert over the skull a single bowl, almost always killed by a hole knocked in the bottom by striking with a pointed instrument either from the inside or outside. The sacrificing of the pottery evidently took place at the time of interment, as the pieces broken out were often found over the body or on the skull. One bowl had been killed four times and another sacrificed by drilling the hole instead of breaking out a piece. Apparently for economy's sake, large sherds had sometimes been punctured and placed over infants. The arrangement, when there was more than one bowl in a grave, had been either to nest the bowls over the head, or to invert one over the skull and the other on the body or at one side. When small jugs were included they were never killed, and were usually placed near the shoulders. Two bowls, one or both killed, were found with 24 child and with 42 adult burials; 3 pieces of pottery, 1 and occasionally 2 killed, in 7 child and 11 adult graves; 4 pieces of pottery, 1, 2, and 3 bowls killed, in 3 child and 6 adult graves; 6 bowls and jugs, 1 bowl killed, in 2 child graves; 7 bowls and jugs, with 1 bowl killed, in each of 2 graves, 1 of a child and 1 of an adult. Plate 22 shows pottery *in situ*.

Jewelry. The jewelry offerings were about equally divided between adults and children; 31 children and 20 adults wore beads of different kinds around their necks. Often a turquoise ear pendant would be found on either side of the skull. On 2 adult arms, beads were strung as bracelets. In the case of 2 other skeletons, strands of beads were found around an ankle.

Sixteen children and 12 adult skeletons wore *Glycymeris* shell bracelets, varying in number from 1 to 8 for the children, to as

many as 26 and 27 bracelets with 2 adult burials (Plate 73). The small carved stone and shell ornaments (Plates 74-76) illustrate the diversity of other offerings of jewelry.

Miscellaneous. The miscellaneous offerings in graves consisted of a clay animal, pottery discs, oddly shaped concretions, quartz crystals, obsidian flakes, pieces of copper ore, iron oxide, lead crystals, and cakes of pulverized red oxide. In 1 infant grave a quantity of powdered red ore had been thrown over the body. One child was accompanied by its pet rabbit, which had apparently been sacrificed and covered by a part of a bowl. Only 4 adult and 2 infant graves contained any of the small stone tablets or plaques which are described on page 51. Only 5 of the many bone awls recovered were found in grave fills. No pipes or warlike implements such as axes, clubs, or arrow points, were ever found with the dead.

METHODS OF EXCAVATION

Description. Conditions may vary even at nearby sites. Hence the methods of excavation followed at the Swarts Ruin, which lies in the river bottom, would not be suitable for one on the point of a mesa where, at a given depth, there is likely to be a clearly defined deposit below which no cultural remains are to be found. Our procedure was as follows: after establishing a base line, the ground was staked off in 20-foot squares. Excavation was started at one corner of the ruin and continued until a house foundation was encountered. Following this clue, the inside of the room was outlined and the corners found by digging a shallow trench, as shown in Plate 23, a. Next a test hole was dug to locate the floor; then the room fill was cleared to within 5 or 6 inches of the floor, all sherds and other objects being saved and the type of fill noted as the work progressed (Plate 23, b). Fallen roof timbers and stone and pottery objects were left in place. Careful scrutiny of the soil for small artifacts in the roof debris or on the floor necessitated the use of trowels instead of shovels in removing the last 6 inches. After the floor was cleared the room was photographed by the aid of a 16-foot tripod, from the top of which a picture could be taken showing the complete outlines of the room, the construction of at least three walls, and most of the floor with all objects *in situ* (Plate 24, a). Notes were made of the material found on the floor and its relation, if any,

to architectural features. In all cases inside dimensions of rooms were taken. Inner corners were then located for the map by measuring from survey stakes. The finished ground plan automatically recorded the varying thicknesses of the walls.

Floors were broken with light picks and the digging was continued with trowels, since it was never known where or at what depth a burial might be encountered. A few of the 17 skeletons below a single room, with their offerings of pottery and metates, can be seen on Plate 24, *b*, which well illustrates the need of painstaking work in such a chamber. The bulk, indeed, of the earth moved at Swarts was taken from beneath houses, the excavations often running to a depth of 5 to 6 feet before all signs of occupation disappeared. Where houses had been built over refuse, all the sherds were saved, and if the deposit gave evidence of stratification, were segregated according to noted levels.

After the main buildings were finished, areas between and well outside the house clusters were completely excavated to determine the extent of the culture deposit and to avoid missing any outlying houses. Many close-up and general photographs of rooms were taken as the work progressed, and by numbering the rooms and recording the direction of the view, pictures were obtained which proved to be invaluable, not only for illustrative purposes but also to correct errors which had crept into the field notes.

The skeletal remains were in extremely bad condition, the result of being in the valley where drainage from the side hills and periodical rises of the river subirrigated the soil in which the bodies lay. In the sixty years since the coming of white settlers, additional water had been diverted from the river and thrown on the land for irrigating purposes and this had soaked shallow graves which before then may have been comparatively dry. Much time was spent in clearing skeletons for photography and in recording their physical characteristics. Where work was so delicate that even the small trowel became too clumsy, a varnish brush with a steel blade attached to the end of the handle was found to be of great assistance in developing skeletons, and in slightly undercutting and brushing away the dirt below the bones, when a shadow was required to make a clear cut photograph. In most cases the bones were too fragile to be lifted. Only by the use of paraffin to strengthen them was it possible to save 8 complete skeletons and 23 skulls. For close-up pho-

tographs, burial numbers not over three-quarters of an inch in height did not greatly mar the picture, but if lantern slides or reproductions of outstanding features were contemplated, retakes were made without the numbers.

Because cultivated fields closely surrounded the Swarts Ruin, there was no way of disposing of the dirt save by back-filling previously excavated rooms (Plate 12, *a*).

MISCELLANEOUS MATERIALS RECOVERED

Stone. The methods of shaping and finishing stone in the Mimbres area were as follows: first, pecking and crumbling; second, chiseling, gouging, and scraping with flaked tools (as indicated by marks on specimens of soft stone); third, grinding; fourth, drilling with a flint point; fifth, polishing. The method of polishing the better articles of jewelry is obscure, but judging from the luster obtained, a fine abrasive mixed with oil or water and applied by means of a leather pad might have been used to produce the observed finish. In polishing axes, a similar abrasive could have been employed on a larger surface, such as a piece of wood.

Stone carving was not extensively practiced, but such work as was done shows skill in producing life forms and delicately carved and polished trinkets (Plate 74, *q-s*).

Stone Dishes (Plate 25): 1 complete, 11 fragmentary; appearance crude; outsides show marks from blows of sharp instrument or use of abrading stone; insides gouged out with a chisel and scraped with an edged tool [the lava (vesicular basalt) dish probably shaped by pecking and crumbling process]; 9 round in form, 3 rectangular; slightly rounded bottoms; rounded or thinned rims; 1 dish of lava, 1 of sandstone, the rest of tuff; round dishes 3 to 7 inches in diameter; oblong dishes 5½ to 6 inches wide, length not determined due to fragmentary condition; walls ½ to 1½ inches thick.

The fragmentary dish, *b*, is the only one decorated with incised lines; *c* is well smoothed; and *g* was broken by blows of the chisel. The lava dish, *d*, has projecting knobs at corners. It is discolored with iron oxide, and its porous, hard consistency makes it the only one in the collection suitable for grinding pigment. One shallow dish (Plate 28, *c*), figured with the small mortars, was discolored by

paint. The customary use of these vessels is problematical. Dishes were found in fills of rooms, on floors, and below floors, but not with burials. The only 2 found in connection with the Early occupation were on the floors of Pit-rooms U and AB.

Dishes made of tuff and a few of sandstone and lava have been noted from other ruins in the Mimbres region.

Stone Bowls and Cup (Plates 26 and 27): 1 cup and 12 bowls; all but 5 fragmentary; sandstone bowls smooth; some fragments of the closer grained tuff bowls well smoothed, but others, of more porous rock, pitted and rough; most of the bowls globular in form; all but 1 with vertical inside walls; rims thinned and bottoms somewhat flattened.

Two bowls in the collection are of sandstone; the cup and the rest of the bowls of tuff. The sandstone bowls are $2\frac{3}{4}$ to $3\frac{1}{2}$ inches high, with outside diameters measuring $4\frac{3}{8}$ to $5\frac{1}{2}$ inches. The bowls of tuff are $1\frac{3}{4}$ to $3\frac{1}{4}$ inches high, with outside diameters of 3 to $5\frac{1}{2}$ inches. The cup, *d*, is $2\frac{1}{2}$ inches high, $2\frac{3}{16}$ inches outside diameter. This cup, the only one found, shows on the interior the striations of a drill instead of the marks of hollowing by gouging or chiseling. The sandstone bowl, *f*, on the same plate, is so symmetrical that it gives the impression of having been turned on a lathe. The inside diameters of the opening do not differ by $\frac{1}{16}$ of an inch. The rim is incurved as in the pottery seed bowls. A fragmentary bowl (Plate 27, *c*), restored in the drawing, is $4\frac{1}{2}$ inches in diameter. Its inner walls are perpendicular. This bowl is also very symmetrical and of soft sandstone that could easily have been scraped into the desired form. The outer surface is painted yellow, and set on the sides $\frac{1}{2}$ an inch below the rim are four equally spaced panels, $1\frac{1}{2}$ inches long by $1\frac{3}{4}$ inches wide, made up of four bars $\frac{7}{16}$ of an inch wide, which are colored green, black, yellow, and red.

The carving of the two effigy bowls (Plate 27) is unusual. The bowl *b*, cut from tuff, is 4 inches in diameter and stands $3\frac{3}{4}$ inches high. It is carved to represent a frog or toad with eyes in relief and mouth and forelegs indicated by incised lines; the outlet or lip is formed by a rounded channel passing over the head. The bowl *a*, also of tuff, $3\frac{3}{4}$ inches in diameter and $1\frac{3}{4}$ inches high, is carved more carefully, with eyes and legs in low relief, the mouth an incised line; the sides are painted green, the underside yellow.

It is probable that the stone bowls were used as paint containers,

and the decorated and carved specimens for ceremonial purposes. Most of the bowls were found in fills and on the floors of rooms. Only one was found below a room floor. Bowls occur throughout the Mimbres area; one similar to *c*, Plate 27, was found at another site on the Mimbres. A painted bowl resembling the above, from the Blue River of southeastern Arizona, is figured by Hough.¹

Small Mortars and Paint Cups (Plate 28): 54 in collection; most of them natural stones of irregular shape, crude in appearance, with depressions cut or worn in; usually ovoid, but in a few instances nearly round in shape (little attention given to shaping them); 2 of sandstone, 14 of lava, and 38 of tuff.

The rounder mortars range in size from $1\frac{1}{4}$ to $6\frac{1}{2}$ inches outside diameter; 1 oblong sandstone mortar is 8 inches long; 1 of lava is 10 inches long. With the exception of 1 large lava mortar, all the others of this material are smaller in size and not as deeply cut as those made from softer stone. Specimen *f*, of lava, though large enough for grinding other substances, is placed in the class of pigment mortars, as the bowl is colored green with pulverized copper carbonate. The shallow, flat, sandstone dish *c*, $3\frac{1}{4}$ inches in diameter and 1 inch thick, being discolored with green pigment, is also considered a mortar. The stone *d*, Plate 29, which was found incorporated in the south wall of Room 5, has 8 depressions on one side. It is a large river boulder, 15×18 inches, and before its use in house construction, was probably pitted in this manner by having pigment ground in the shallow depressions on its face.

That dry paints were not always ground in small mortars is shown by manos colored green by pulverizing copper oxide on a metate. The small mortars may have been used as paint cups; none, however, show discoloration except from minerals. Possibly unfired organic potter's paint, if used, has been absorbed by the soil and left no trace. Mortars were found in room fills, on floors, and below them. Only one came from a grave fill. Their distribution is general throughout the Mimbres region.

Large Mortars (Plate 29): 9 were found; usually unshaped river boulders with holes of varying depths worn in them from the use of a heavy pestle; generally of lava, but occasionally of sandstone; ranging from 14 to 18 inches in diameter.

The waterworn chunk of sandstone, *a*, is 6 inches thick, with a 6-

¹ Hough, 1914, *Culture of the Ancient Pueblos of the Upper Gila River Region*, Fig. 49, p. 31.

inch hole worn into the block until it has started to break through; *b*, a piece of lava, is 16 inches in diameter, with a $6\frac{1}{2}$ inch hole worn to a depth of $5\frac{1}{2}$ inches; and *c*, also of lava, the only shaped large mortar found, is $11\frac{1}{2}$ inches in diameter, the cross section showing a 7-inch tapering hole, which has perforated the stone.

Mortars were used in crushing nuts and seeds and in the initial steps of cracking dry grain. A considerable waste from flying particles was prevented by confining the material in the deep hole. So few mortars were uncovered that they do not appear to have been a necessary adjunct to the metate for grinding food. They were found on floors of rooms, in room fills, and in places outside the buildings. In some instances a broken mortar was thrown into a grave or used in the building of walls.

The above type is to be found throughout the Mimbres region. There are also mortars excavated in boulders and rock outcrops, usually located near ruins or in the vicinity of tillable land. Some of these milling holes are shallow, while others are from 14 to 16 inches deep. They average 6 inches in diameter at the top and are tapered to $\frac{1}{2}$ less at the bottom, as a result of the pestle's striking the rim as it enters.

Pestles (Plate 30). Pestles of the large type, *b*, suitable for heavy work in the large mortars and in milling holes in rock outcrops, are represented by only 5 perfect specimens, although the rounded points of 25 broken ones came to light. The ends are uniformly rounded from the wear caused by crushing the substance placed in the mortar. Little attention was given to working down the sides, and any cylindrically shaped stone, sufficiently long and not too thick, seems to have served the purpose. The one figured at *b* is of close grained lava, and is $13\frac{3}{4}$ inches long by $3\frac{3}{4}$ inches in diameter. The remaining 4 complete pestles are rough in appearance; they average $11\frac{3}{4}$ inches in length. One is of quartzite, the others of porphyritic rhyolite and sandstone. The pestle *c* is $17\frac{1}{2}$ inches long, $2\frac{1}{2}$ inches wide and $1\frac{3}{4}$ inches thick. It is of gray amphibolite schist, and, although sufficiently long to have been used in a deep mortar, appears too slender for heavy pounding. Pestles similar to these and longer have been found in other parts of the Mimbres area. The small pestle of amphibolite schist, *d*, $6\frac{3}{4}$ inches long, $1\frac{1}{2}$ inches wide, and $\frac{3}{4}$ an inch thick, and *e*, of brown quartzite, 7 inches long, $1\frac{1}{2}$ inches wide, and 1 inch thick, the only two of this kind found,

show wear on their ends from grinding, and also a rubbed and polished condition on their sides from use in some other way. The cylindrical pestle, *a*, 1 of 3 of tuff, is $2\frac{3}{4}$ inches long and $1\frac{1}{2}$ inches in diameter. This pestle, though short, is well adapted to the grinding of paint in both the deep and shallow types of pigment mortars. As very few small pestles were found, it is probable that river pebbles of convenient shape were used in the numbers of small mortars taken from the ruin. Two heavy, short, cone-shaped pestles of porphyritic rhyolite and sandstone are figured on Plate 43, *d* and *e*.

As a necessary adjunct to the large mortar, heavy pestles are well distributed throughout the area, not alone in village ruins, but also near the milling holes in ledges, in the open, and below rock shelters.

Palettes (Plate 31). A considerable number of these were found. They are made of thin pieces of stone, some shaped, some irregular; in size they vary from 2×3 to 8×11 inches. Upon them are daubs of color caused by mixing dry pigment with oil or water; the discolorations indicate the use of several different shades of red and yellow oxides. The reverse side of the large palette, *c*, has a spot of black paint and another of blue copper carbonate on it. The small specimens, *a* and *b*, come under the classification of tablets or plaques (Plate 56) but are included here as they were used as palettes. If unfired vegetal substances were mixed with the oxides rubbed on these palettes, all traces of them have disappeared, leaving only the mineral constituents. Palettes were found in rooms. They occur also at other Mimbres sites.

Metates (developmental series, Plate 32; cross sections, Fig. 1). Of these there were 66 whole, 436 broken and discarded. A boulder of suitable size and cutting quality was selected and either left in its original form, or roughly shaped into a rectangular block. The metates are made from porphyritic rhyolite, sandstone, and fine to coarse grained lava, the latter stone being most commonly used. They range from 10 to 16 inches in width by 16 to 21 inches in length. Type 1, Plate 32, *a*, the primitive mealing stone, which is associated with the Early subterranean type of house, had its beginning as an unshaped boulder with a circular depression worn from the use of any convenient round stone that could be grasped in the hand and manipulated with a more or less rotating motion. In Type 2, *b*, also associated with the Early houses, the round grinding hole becomes elongated into an oval depression, the result of

drawing the hand-stone back and forth. From this movement a face was worn on the original round hand-stone, as it cut into the metate, producing the turtle-back, rocker-bottom mano (Plate 33, *a* and *b*) which fits the depression perfectly. Metate Types 1 and 2 (Plate 32, *a* and *b*) are primitive in appearance and do not have the advantage of allowing the meal to work itself through and fall off the end, as in the more improved varieties. The development into

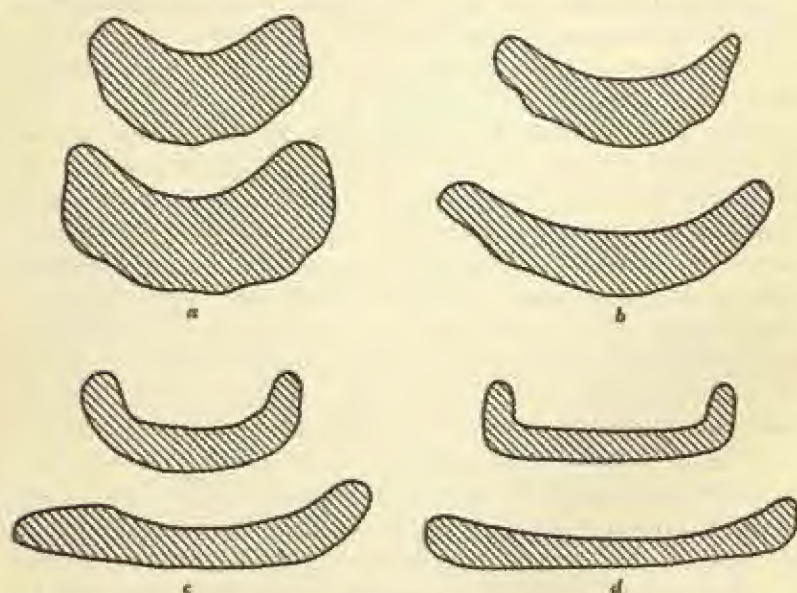


FIGURE 1

Transverse and longitudinal sections of metate arranged in order of development:
a, Type 1; *b*, Type 2; *c*, Type 3; *d*, Type 4.

Type 3 (Plate 32, *c*) found in the Late houses, was undoubtedly the result of lengthening the stroke of the turtle-back mano, until a channel was worn through the metate throughout its entire length. This is indicated by the rounded bottom of the trough in those which saw service before the flat-faced, oblong mano came into use. The final, perfected type, 4 (*d*), was formed by first pecking a shallow, flat depression into one face of the stone for its entire length, leaving a marginal ridge on either side, the channel becoming deeper from the wear of a flat, oblong hand-stone.

In pit-houses at Luna, New Mexico, Hough found, on the floors

of the rooms, crude metates similar to the Early mealing stones from Swarts. His Figure 10 and Figures 11-13¹ closely resemble our Types 2 and 3.

As a result of the foregoing observations, it would seem that the finished metate of this district had its beginning in the crude, shallow mortar.

Metates set in adobe were never found in the rooms. In a number of instances two or three of different grades of coarseness lay on the floors of houses. Apparently stones of different textures were selected, over which nuts or corn passed in a series of operations to reduce them to meal.

Manos (Plates 33 and 34): 676 perfect, 631 broken; in outline, elliptical and oblong, with rounded corners; made of sandstone, fine grained conglomerate, coarse grained porphyritic rhyolite, and lava, the latter material being by far the commonest; elliptical manos 7 to 8 inches long, with average width of 5 inches; oblong manos 7 to 11 inches long, by 3½ to 4 inches wide.

Manos are of four kinds. The earliest are ovoid or round river stones with smoothed surfaces suitable for the Type 1 metate. Next in order are *a* and *b*, Plate 33, two views of the elliptical or turtle-back, rocker-bottom mano, which has a decidedly convex grinding surface; this represents the second stage of development from the river boulder hand-stone. Such specimens were employed on Type 2 metates and they continued to be used in later times when the Type 3 metate with round-bottom channel appeared. Plate 33, *c* and *d*, presents two views of a transitional rectangular form following the turtle-back; it has a convex grinding face and fits a Type 3 metate. The oblong rectangular manos (Plate 34), with nearly flat grinding surface, belong to the finally perfected Type 4 metate.

The oblong manos of the third and fourth stages were originally thick. They were pecked to shape, and had slightly rounded corners. Plate 34, *a*, shows a mano in process of manufacture, which has never been used for grinding. The edges, grinding surfaces, and backs of worn oblong manos are illustrated by *b-d* of the same plate. Some of the manos have had channels pecked on both edges to facilitate gripping them with the fingers, as seen in *b* and, though not so clearly indicated, in *a*.

¹ Hough, 1910, *Pit House Village at Loma, New Mexico*, pp. 416-417.

All types of manos from the Swarts ruin are worn uniformly as a result of being held flat on the metate. Only a few occur which were reduced to a wedge shape, as is typical of manos farther north. Hough attributes the beveled grinding surface of manos worn to a chisel edge to the raising of the hand-stone from the metate during the stroke.¹

Manos were probably used for pulverizing potter's clay, as well as for grinding corn and other foods. When a quantity of green pigment was needed for painting wooden objects (such as were found in a nearby Mimbres shrine cave), the metate and mano were used for grinding it, as is indicated by the fact that manos were found discolored by copper carbonate.

Manos were taken from fills of rooms and from below floors. When a metate was found on a house floor, 1 or 2 manos which fitted it usually lay close by. One milling room containing 5 metates had 26 manos scattered on the floor.

Small Metate-like Grinding Stones (Plate 35): 4 specimens; shallow grinding stones; have the appearance of small, flat metates; made of tuff, sandstone, or lava; $7\frac{1}{2}$ to 10 inches long, $4\frac{1}{2}$ to $5\frac{1}{2}$ inches wide.

The concavity in *a* and that in *b* are oblong with ends and sides of the shallow depression sloping to the bottom; the shallow troughs through *c* and *d* show wear from the stroke of some object rubbed along the entire length of the stone. Their use is obscure, but judging from the wear on their surfaces, pigment, potter's clay, or other substances could have been pulverized on them with a rubbing stone. Two were found below the floor of the Early Pit-room AB, the others in the fills of Late houses.

Rubbing Stones (Plate 36; Fig. 2): 182 whole and fragmentary specimens; outlines square, oblong, ovoid, and round, with one or both sides having flattened and worn surfaces; made of sandstone, fine grained conglomerate, tuff, coarse grained porphyritic rhyolite, or fine lava; in width or diameter $2\frac{1}{4}$ to 4 inches, in thickness, $\frac{1}{2}$ of an inch to 3 inches in loaf-shaped examples.

Plate 36, *a* and *b*, are stones of suitable size picked up at random, with a face worn by use on one side; *c* is so shaped as to resemble a loaf of bread with the bottom worn smooth and has a shallow channel on one side; and *d* is nearly square, $1\frac{1}{2}$ inches thick, with a cir-

¹ Hough, 1914, *Culture of the Ancient Pueblos of The Upper Gila River Region*, p. 12.

cular depression on either side, by which it could be gripped when the edge was being used for rubbing.

From the square form, the stones merge into flat, round-cornered rectangles (*e*), ovoids (*f*), and then into discs (*g* and *h*), all of them having both sides worn smooth. All edges have been dressed with the pecking hammer. The rectangular and ovoid forms are usually

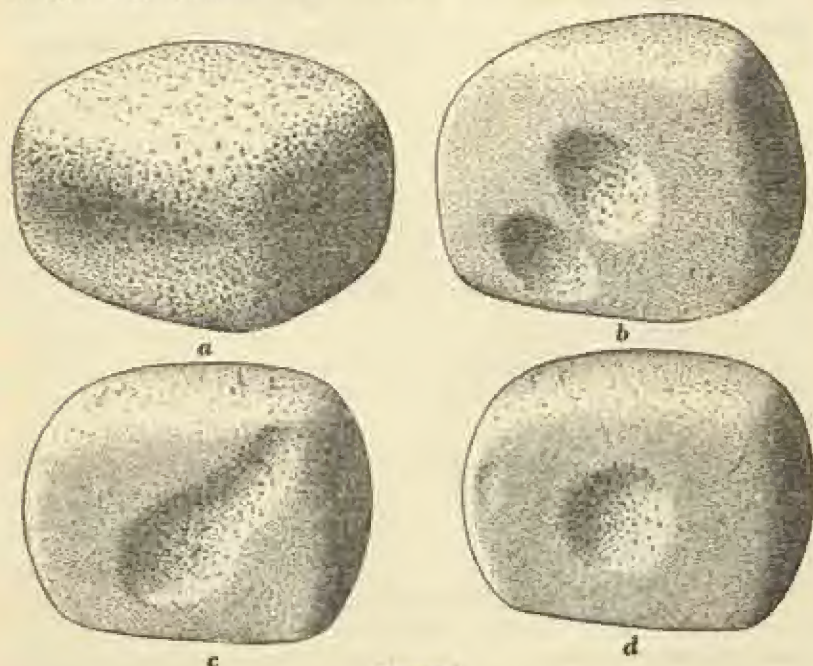


FIGURE 2

Rubbing stones with depressions for grasping with fingers and thumb.
Specimen *b* is $4\frac{1}{2}$ inches long.

thinner than the small discs which are from 3 to 4 inches in diameter and occasionally as much as 2 inches thick. The types represented by *f* and *g* are of a size easy to hold in the hand. The stone *h*, with one side polished, is an unusually large disc, $6\frac{1}{2}$ inches in diameter by $3\frac{1}{2}$ inches thick, and would require the use of both hands. Figure 2, *a*, p. 75, similar to some manos, has shallow channels pecked on opposite edges; the thick stones, *b-d*, with one edge used as a rubbing face, have finger-holds and thumb-holds on one side and a circular depression on the reverse side, as shown in *d*.

Little can be said as to the probable use of these hand-stones. Judging from the number found throughout the ruin and noted all over the country, they took almost as important a place in the daily life of the people as did the *mano* and *metate*. It is possible that they served to finish the excellent adobe floors found in many of the rooms of the pueblo.

Abrading Stones (Fig. 3). Abrading stones or rasps were fairly common. They are oval, square, and oblong in form, and are shaped

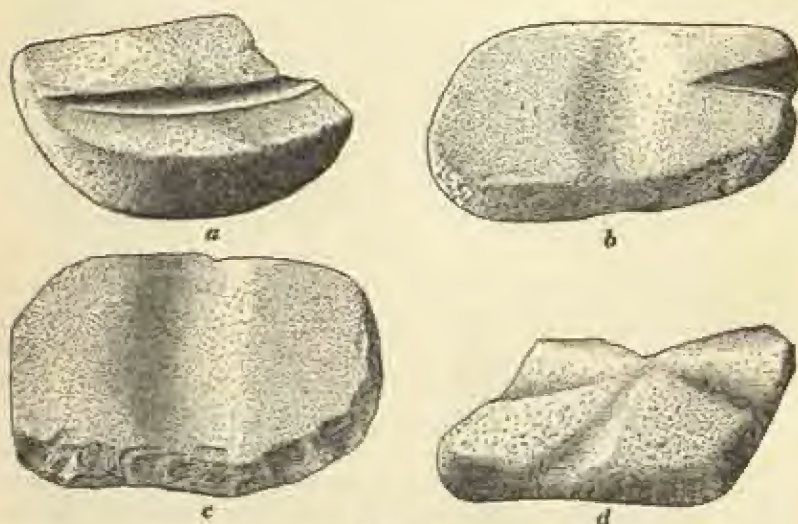


FIGURE 3

Abrading stones: a-c, sandstone; d, porphyritic pumice. Specimen b is $4\frac{1}{2}$ inches long.

to a convenient size for holding in the hand. Usually they are made of sandstone of various degrees of abrasiveness, occasionally of the sharp porphyritic pumice. In size they run from $3\frac{1}{2}$ to 5 inches long, $1\frac{1}{2}$ to 4 inches wide, and $\frac{3}{8}$ of an inch to 1 inch thick. An irregular piece of sandstone, a, has a groove worn by pointing tools upon it. In this case the stone was at rest and the object to be cut was moved across it. On account of the surface wear, b-d are termed rasps, indicating that they were held in the hand and moved along the object to be sanded down. These hand-stones could have been used in whetting axe blades as well as in dressing bone and wood. They

were found in rooms throughout the ruin and have been noted and collected throughout the Mimbres territory.

Beaming Tool (Plate 29, *e*). The beaming tool is one of several found. It is a piece of quartzite of natural form, $18\frac{3}{4}$ inches long and $5\frac{1}{2}$ inches wide. The sides and rounded edges are smooth and polished, apparently as the result of being rubbed on a soft substance, such as leather in process of tanning.

*Axes*¹ (Plates 37, 38, 39). There are 33 in the collection. The side views show a distinct taper from the head downward. In the case of only 2 axes (Plate 37, *d* and *e*) is the length of the cutting edge less than the width of the blade at the groove. Among the 30 perfect specimens, 1 has a somewhat squared head with flattened top; 2 have truncated-cone-shaped heads; 6 have roughly rectangular heads; and 20 have more or less rounded heads, placing this type in the majority. Blade *e* (Plate 39) is made of quartz mica schist containing sillimanite and garnets; 2 are of basalt, and the rest of diabase (greenstone). They range in length from 4 to $7\frac{5}{16}$ inches; in width at the top of the bit from 2 to $3\frac{1}{2}$ inches; and in weight from 1 to $4\frac{1}{4}$ pounds. There are 21 three-quarter-grooved with channel on both sides and one edge; 9 are full-grooved with hafting channel encircling the bit; and the type of groove on 3 broken axes could not be determined. The hafting grooves are $\frac{3}{4}$ of an inch to $1\frac{1}{2}$ inches wide and all are set at right angles to the long axis. Many axes appear to have an intentionally formed ridge just below the groove, but this is merely the result of thinning the upper end of the bit when the axe was first pecked into shape. When the blade was dulled this ridge became emphasized because of the thinning necessary to make it once more fit for service (see the very old resharpened axe, *b*, Plate 39). Specimens *d* and *e* (Plate 38) are resharpened tools which appear to have originally been polished over their entire surfaces. Care was taken in the secondary thinning of the blades to leave a straight line abutting the polished surfaces on the two edges, thus producing a decorative effect. Fewkes figures, as illustrative of secondary pecking, a similar axe from Casa Grande, Arizona.²

The unusual axe, *e*, Plate 39, found on the floor of Early Room Z,

¹ The terminology used in the discussion of the various parts of these axes agrees with that which describes the modern axe. This nomenclature was confirmed by Fayette R. Plumb of Philadelphia, one of the foremost manufacturers of axes.

² Fewkes, 1912, Casa Grande, Arizona, Plate 55.

cannot be assigned a place in the classification of Mimbres axes. Viewed from the side and edge the outline is very symmetrical. The ridges above and below the groove on the sides are not high; and on the edges there are prominent projections below the groove. Sporadic finds of similarly shaped axes have been noted from Massachusetts, Rhode Island, Delaware, Pennsylvania, and North Carolina. Stevenson catalogues as unique one from Walpi in the National Museum collection.¹ The small numbers of these axes in collections and their wide distribution seems to show that they are an embellished form, locally derived from the ordinary full grooved axe.

The selection of stones of tough material, conforming as nearly as possible to the desired shape, often resulted in the production of a serviceable axe with little expenditure of labor, while a finely formed blade would require more time. All shaping was accomplished by the crumbling blows of a hand hammer, after which the cutting edge was sharpened by rubbing on another stone. In something over $\frac{1}{2}$ of the axes, the entire surface has been smoothed by grinding or through use, but the grooves do not seem intentionally to have been polished, although occasionally they bear polished spots, probably caused by the friction of the wooden haft. The axes in process of manufacture (Plate 37, *e*, and Plate 39, *d*) have been pecked to shape and would have been ready for use after having their cutting edges sharpened by grinding. Many axes have an edge keen enough for cutting wood. Even when dulled these would have been serviceable for breaking dead branches from trees. That they may thus have been used is indicated by surface finds of dulled specimens in parks covered with growths of juniper. Axes whose blades were broken off too short for regrinding show by battered ends that they were employed for pecking other stone implements to shape.

The method of hafting axes in this area is not definitely known. So far as the writers are aware, no axes with handles attached have been found in Mimbres caves. A wedge for tightening the withe on a three-quarter-grooved axe could be driven between it and the smooth edge of the bit. A three-quarter-grooved axe, found in the Mimbres Valley, had two knobs or projections on either side of the ungrooved edge that would hold a tightening pin in place. Morris describes and illustrates hafts for grooved picks found in an aborig-

¹ Stevenson, 1883, *Illustrated Catalogue of the Collections from Indians of New Mexico and Arizona in 1879*, p. 375.

inal salt mine near Camp Verde, Arizona.¹ He states that "In the making of a haft, the following recapitulates the procedure. After the stick was cut to the desired length and the limbs dressed off, a transverse notch was cut into one side as far as the heart, from $1\frac{1}{2}$ to 3 inches from the thicker end. The length of the groove in the pick to be hafted was roughly measured off on the stick and a second notch cut on the same side of the stick at whatever distance this might be from the first. The wood between the notches was split out and the flat surface thus produced made convex, the better to fit into the concave groove on the pick. The stick was bent, the thinned, more pliable part filling the groove. The short end was forced as near as possible to the long one and the two bound together with yucca fiber." He also says, "This shape of haft explains the three-quarter groove characteristic of the Gila type of ax."

Although we have no specimens from the Mimbres to illustrate the method of hafting, it seems probable that the above-described type of handle might have been used for Mimbres three-quarter-grooved axes. The full-grooved axe, however, was doubtless hafted by wrapping a withe twice around it.

Axes were found on, and cached below, house floors or in room fills, where they had come down with the roof debris.

The above type of axe occurs throughout the district. Its three-quarter groove allies it to the Middle Gila axe, though very few possess the long celt-like bit characteristic of that region. No double bitted axes were found at Swarts; nor have they been observed elsewhere in the Mimbres area.

Stone Mauls or Sledges (Plate 40, full-grooved; Plate 41, three-quarter-grooved): 19 in the collection; made from river stones, some irregular but most of them elliptical in form; 6 of lava, 12 of coarse grained porphyritic rhyolite, 1 of tuff; length ranges from $4\frac{1}{2}$ to $6\frac{1}{4}$ inches, and weight from 2 to $4\frac{1}{2}$ pounds.

In method of grooving they are equally divided between the three-quarter and the full-grooved types. Only two of the specimens (Plate 40, *c* and *e*) are intentionally shaped; *c*, made from the impractical substance, tuff, has the appearance of a plug, but as the point is triangular in section, it could not have served efficiently as a stopper; *e*, of porous lava departs from the common types in having a raised ridge on either side of the groove. It can be likened to a

¹ Morris, 1925, *An Aboriginal Salt Mine at Camp Verde, Arizona*, p. 80 and Figure 3.

well balanced double peen hammer with heads of the same length and approximately the same diameter. Stevenson describes a sandstone maul of this form from Walpi.¹

The material of which the mauls are made does not lend itself to the heavy work of quarrying or flaking dense stone, nor do the ends show the effect of such use. The mauls would have served for knocking limbs from dead trees or for breaking up dry wood for domestic use. Specimens were found outside buildings, in room fills, and on and below floors. Only 1 came from the fill of a grave. The maul was a common implement throughout the area.

Hammer Stones (Plate 42, *b-d*): 933 counted; of irregular rounded forms; made from dense stone; diameters average 2 to 2½ inches, some diameters of 3½ inches.

Specimen *b*, of magnetite, one of several, would have been useful because of its weight and durability; *c* is of white rhyolite felsite; *d*, of basalt, still retains angular surfaces, which, in pecking, would enable it to cut rapidly. Before being discarded, these stones were used in crumbling and wearing down other objects of stone or as grinders, as is evidenced by the fact that several of them are discolored by copper oxides. The discoidal hammer (Plate 42, *a*) with finger-hold on one side, the only one of its sort found, is made from porphyritic rhyolite. It is 2½ inches in diameter, 1½ inches thick. In form it resembles the light-duty pounding stones *a* and *b*, Plate 43, but the periphery is worn by use in pecking and crumbling until it duplicates the examples illustrated and described by Holmes.² Hammer stones similar to *b-d* seem to have been the most common tool for pecking and chipping stone. They were found everywhere in the ruin, in fills and on house floors, and are abundant throughout the entire area.

Club Heads (Plate 42, *e-h*). Club heads are represented by 8 specimens. Of these, 3 are three-quarter-grooved, with channel on the sides and one edge; the rest are fully grooved; 6 are made of diabase, 2 of tuff. They vary in length from 2½ to 3½ inches; and in thickness from 1½ to 2½ inches. The head *e*, of the soft material, tuff, and the diabase heads, *f* and *g*, from their form, seem to be true war clubs. The head *h*, 1 of 5 reused broken axes, may have served a like purpose, but its battered end shows the effect of use in other

¹ Stevenson, 1883, *Illustrated Catalogue of the Collections from Indians of New Mexico and Arizona in 1879*, p. 376, Figure 506.

² Holmes, 1915, *Handbook of Aboriginal American Antiquities*, p. 322.

ways. These club heads are found in limited numbers throughout the Mimbres country.

Pounding Stones and Crushing Implement (Plate 43). There are 2 discoidal pounding stones (*a* and *b*) with depressions pecked on the sides for finger-holds. These are made of dense sandstone or close grained lava, and vary from 3 to 4 inches in diameter, and from $2\frac{1}{2}$ to $2\frac{3}{4}$ inches in thickness. The edges are slightly worn by light work, but they are not sufficiently chipped to warrant belief that they were used for striking off large flakes.

There are also 2 truncated-cone-shaped pounders (*d* and *e*) which have the appearance of mullers or short, heavy pestles, with slightly flattened sides. They are of coarse grained porphyritic rhyolite and sandstone, 5 and 6 inches long, and $3\frac{1}{2}$ inches wide at the greatest diameter of base. The butts are rounded and show wear from pounding and crushing, either on a rock or in a mortar. Although they somewhat resemble pot-rests or supports for cooking vessels, and although they were found on rooms floor, they were in no way associated with fireplaces.

The crushing stone, *c*, the only one found, appears elliptical in form when viewed from the side. The upper third is narrow, and the working face uniformly rounded. It is made of coarse grained porphyritic rhyolite. The narrowed top was an aid in grasping the tool, allowing it to be rolled in all directions. It weighs 8 pounds, and is too unwieldy to be easily lifted. By rocking the stone, little effort would be required to crush leaves and roots, or to pulverize clay laid on a flat surface.

Stone Hoes (Plate 44): 12 perfect and 13 broken specimens; made from thin, natural plates of olivine andesite; shaped and more or less standardized in form; length varies from $4\frac{1}{2}$ inches to 10 inches, width at base from 2 to $2\frac{1}{2}$ inches, thickness from $\frac{1}{8}$ to $\frac{1}{2}$ an inch; 6 of the longest specimens have rounded bases, in the shorter specimens, bases tend to be straight; edges roughly finished by strokes of a hammer, which removed flakes from both sides of the blade.

Their identification as hoes may not be correct, as none of those from Swarts are worn on the edge or at the point. Similar tools, however, from other sites in the Mimbres territory have smoothed and rounded points, apparently caused by digging in the earth. None of the blades are notched, which leaves the method of hafting, if any, uncertain. The hoes came from Early Period pit-rooms,

and Middle and Late Period houses; they were found in room fills, on, and cached below, floors. Hoes occur throughout the Mimbres region.

Smooth-edged Stone Saws (Fig. 4). There are 3 in the collection. They are made from thin sheets of fine-grained sandstone, with straight or rounded back and beveled and sharpened edge. They are from $2\frac{1}{2}$ to $3\frac{1}{2}$ inches long and $\frac{1}{4}$ of an inch thick. Experiment proves that they will quickly widen and deepen a scoring in a bone, so that it can be easily split or broken. The marks of these tools may be seen on a severed deer femur (Fig. 7, b, p. 56), on half a metapodial (Plate 62, a), and on several resharpened bone awls (Plate 63, c and d). Smooth-edged saws are not plentiful in the



FIGURE 4

Smooth-edged saws of sandstone. Specimen c is $3\frac{1}{2}$ inches long.

Mimbres and it is presumed that stone flakes were more often used for this purpose.¹

Stone Cores. Plate 45, a and b, are examples of many nuclei of flint and other material from which fragments for knives, scrapers, or projectile points have been struck; b is $3 \times 3\frac{1}{2}$ inches at the base.

Scrapers (Plate 46; and a large scraper, Plate 45, c). Scrapers made from flakes too thick for points or blades occur in great numbers; usually they are retouched on only one side. These are of all colors of flint, agate, felsite, rhyolite felsite, and other materials; the range in length is from $1\frac{1}{4}$ to $2\frac{3}{8}$ inches. As any conveniently shaped flake was used, there is no regularity in form; b (Plate 46), 1 of 3 similar specimens, is the only one figured that is worked to definite form; c, of which a segment of the thin, sharp edge is ground, should more properly be placed under the head of curved-edge knives. The large scraper, c, Plate 45, the only one of its sort,

¹ Three exceptionally fine specimens were found by us at Hill Top Ruin on the Gila River,

is $6\frac{1}{2}$ inches long by $4\frac{1}{2}$ inches wide, with all edges retouched. The implement is unusually large, and this great size would hasten the operation of fleshing a hide. Scrapers served in dressing skins, and probably for other purposes. These tools are found at all ruins in the Mimbres country.

Curved-edge Flake Knives (Plate 47). These knives were numerous throughout the excavation. They are irregular in form, as struck from the core, and are made of the same materials as the small scrapers, as well as of obsidian. They vary from $1\frac{1}{2}$ to $3\frac{1}{2}$ inches in length. We call them knives because they are thin enough for actual cutting; slightly less than half the number have edges retouched on one or both sides; *b* illustrates a keen edge requiring no sharpening; the thin edge of *d* has been resharpened by whetting. This type of knife was used unhafted. In dry shelters, whittled sticks and shavings attest the use of these blades, and the marks on bone and wood show that those with retouched edges made excellent saws. Flake knives are prevalent throughout the region.

Thrusting and Cutting Knives of a Size to Require Hafting (Plate 48). Those figured are all that were found at Swarts. The large flake, *a*, of gray flint, is $2\frac{1}{2}$ inches long, $1\frac{1}{2}$ inches wide and $\frac{3}{16}$ of an inch thick, with retouched edges; *b*, of gray flint, $2\frac{3}{4}$ inches long, $1\frac{1}{2}$ inches wide, and $\frac{1}{4}$ of an inch thick has both sides flaked. Blades similar to *a* and *b* found in dry shelters of the Southwest and having handles attached with pitch and sinew, make excellent skinning and cutting tools. Specimen *c*, of red rhyolite felsite, $2\frac{3}{4}$ inches long, 1 inch wide, and $\frac{1}{4}$ an inch thick, with both sides flaked, is a fragment of a very old water-worn thrusting blade; *d*, of white rhyolite felsite, $4\frac{1}{2}$ inches long, 2 inches wide, and $\frac{9}{16}$ of an inch thick, has both sides flaked; *e*, of gray rhyolite felsite, is a large flake with retouched edges, $3\frac{1}{2}$ inches long, $1\frac{1}{2}$ inches wide, and $\frac{1}{2}$ an inch thick. The edges of *c* and *d* are dull, making them useful only as sticking knives. Large knives of this type are not common in the Mimbres region.

Projectile Points (Plates 49, 50, and 51). Of the class shown on Plate 49, 94 whole and fragmentary, were found. The materials are: white, gray, yellow, and red flint; pearly white to gray agate; red and brown agate; creamy white chert; and white to gray rhyolite felsite. In length they run from $\frac{1}{2}$ of an inch to 2 inches. The majority fall into two subdivisions: those similar to *a-d*, with straight,

skillfully retouched bases and notches at right angles to axis; and barbed points, *h-k*, with slightly convex or concave retouched bases and oblique notches. Types such as *h-k* are usually of good workmanship; *e* and *f* with straight tang, and *g* with pronounced barb and curved edges, are less common. Typical projectile points of obsidian are figured on Plate 50; 27 whole and fragmentary were recovered. They are usually slender, but occasionally are broad with pronounced barb. They are made of smoky to black obsidian, the majority small, running from $\frac{1}{2}$ an inch to $1\frac{1}{4}$ inches in length. Their size was probably dictated by the small obsidian nodules to be found in this region. This material, of course, lends itself to delicate and elaborate flaking.

Some projectile points not typical of the Mimbres are shown on Plate 51. Of these only a few occurred. The materials are: white, gray, red, and yellow flint, and red and brown agate. In length they range from $\frac{3}{4}$ to $1\frac{1}{4}$ inches.

Projectile points of stone are scarce in the Mimbres area. Evidently small game was killed by arrows with wooden points. On the Doolittle Ranch near Swarts, excavations in a dry cave which was occupied by people of Mimbres culture, produced quantities of reed arrows with pointed wooden foreshafts, but very few foreshafts tipped with stone.

Drill Points (Plate 52). There were 15 found. With the exception of 3, they are sharp-pointed flakes, some of which are made more slender by chipping the sides. All show wear on the point. They are made of flint, agate, obsidian, and felsite; in length the range is from $\frac{1}{2}$ to $2\frac{1}{4}$ inches. Those shown at *a-d*, *f*, and *g* are bead drills, but though delicate and slender are now too dulled to perforate the smaller beads found at this site. The large drills, *e*, *j*, and *k*, if not dulled on the ends, would be classed as arrowpoints. The drills were probably hafted. Specimen *h*, however, with retouched point, could have been held with the fingers.

Stone Doors, Hatch Covers, and Small Slabs (Plate 53). These were found in quantity throughout the ruin. With the exception of a few edges that followed a straight fracture, all were retouched and the corners slightly rounded with a hammer. The slabs are usually oblong, and the smaller ones rather narrow in relation to their length. They are made from laminated tuff, quarried near Old Town Ruin, twelve miles down the valley. In length they run from

14 to 30 inches, in width from 12 to 24 inches, and in thickness from 1 to $1\frac{1}{2}$ inches. The great abundance of the slabs and the variety of their sizes indicate many uses to compensate the inhabitants for the labor of carrying them so far. The slabs *a*, $16\frac{1}{2} \times 26$ inches, and *b*, 20×24 inches, were doors, as indicated by their position in the photographs of Rooms 84 and 109 (Plate 12). A storehouse door similar to *b* is illustrated, bolted in place, by Judd.¹ In two Early rooms, the Transitional Period Room, AD (Plate 5, *b*), and the Middle Period Room T (Plate 8, *b*), were found deep impressions of small posts which had stood vertically in one of the door casings, and which might in some way have been concerned with the fastening in place of stone-slab doors. No similar instances were found elsewhere in the village. During the late occupation of Swarts there were no doors in the outer walls of buildings, and consequently, entrance to the houses must have been through their roofs. That these large slabs were used as trap-door covers is proved by the fact that they were found on the floor where they had fallen when the roof caved in (Plate 13, *b*). The shovel-shaped slab (Plate 53, *e*) is $10\frac{1}{2}$ inches wide, $11\frac{1}{2}$ inches long, and $\frac{3}{4}$ of an inch thick. The circular stone, *d*, 15 inches in diameter and 1 inch thick, was probably used as a cover for a large storage olla; the group of small slabs, *c*, on the same plate, may have served as boards for use in kneading clay. Their use as hot-plates is uncertain as the stone scales in the soil, and none were found blackened from the fire or discolored with grease. Some unfinished slabs were used in the sides of storage bins to ease small openings in walls, for shelves, and to face benches. Fragments served as curbing for fireplaces, and as baseboards and flagging in store rooms (Plate 11, *a*). In one room a large overstock had been stored. Victor Mindeleff describes and illustrates similar slabs of stone used in the Pueblo villages of Arizona for wall coping, roof drains, and to close roof openings.² Shaped stones of this kind, though not always made of tuff, are found in ruins throughout the Mimbres area.

Notched Stone Slabs (Plate 54). Of these, 7, *e-l*, are from Swarts, and 4 are from other Mimbres sites. There is no indication of surfacing or of smoothing the sides, the only work on them being the notches, and the retouched edges, flaked with a hammer; *d* and *f*

¹ Judd, 1916, *The Use of Adobe in Prehistoric Dwellings of the Southwest*, Plate 2.

² Mindeleff, 1891, *A Study of Pueblo Architecture in Tusayan and Cibola*, pp. 151-155 and pp. 201-205.

required no finishing, as the stones came from the quarry in the desired form. The illustration makes clear their shape. Specimens *f* and *j* are of sandstone, *l* of vesicular basalt, and the rest of laminated tuff. They vary in width from 7 to 10½ inches; in thickness from 1 to 1½ inches; and in length from 9½ to 39 inches. With few exceptions these stones are long and slender. The semicircular cuts in the end suggest pole-rests, but the small notches on the edges seem to contradict this theory, unless they served to hold lashings in place. The stone *l*, with a channel over the end and another encircling it, suggests an easy method of suspending it as a weight.

The notched slabs would have made striking grave markers, had it been customary for the Mimbres people to bury in cemeteries outside the village. In the excavations at Swarts these stones and similar ones without notches, resembling posts, were found lying on room floors, but never set in the floor or in a wall to give a clue as to their use.

The side-notched stone, *d*, was taken from a ruin four miles below Swarts by Earl H. Morris, and *a-c*, 3 of many lying on dump-piles left by pot-hunters, came from Old Town Ruin, twelve miles below Swarts. Other specimens of this type have been noted at Old Town that were 15 inches wide at the upper end and 4 feet long. Fewkes mentions notched slabs as occurring in the Mimbres region, where he probably saw them at Old Town Ruin in 1914.¹ Near that site, as we have mentioned, is an outcrop of laminated tuff, from which the material was quarried.

Stone Pipes (Plate 55): 2 complete, 5 fragmentary; 1 of tuff (cloud-blower type), the rest of sandstone, resembling slender cones.

The broken sandstone pipe, *a*, 12½ inches long, ¾ of an inch in diameter at the mouthpiece, and 1½ inches at the large end with bowl ¾ of an inch deep, has a uniform ⅞-inch bore from mouthpiece to bowl. The outside is painted along its entire length with four series of ¼-inch stripes of red, yellow, black, and green. The pipe had been secreted in the rafters of Late Room 72, and fell with the roof when it burned. A fragment of a white sandstone pipe, *b*, with a ¾-inch uniform bore, is completely painted yellow and over this, equally spaced around the circumference, are applied three panels of parallel stripes lengthwise of the pipe, but not extending to the

¹ Fewkes, 1914, *Archæology of the Lower Mimbres Valley*, p. 20.

end. The stripes are $\frac{1}{16}$ of an inch wide, and the colors in order are black, green, and red. In the hole through *a*, the rifling or scoring, produced by a stone drill point attached to a stick, is not completely smoothed out; the hole through *c* and those through the other sandstone pipes are perfectly smooth, probably made so by running a rod back and forth through the barrels after the holes were drilled. There is no evidence to show that the Mimbrenos had knowledge of the hollow drill. The undrilled pipe, *d*, in process of manufacture, showing longitudinal scorings from being rubbed to shape, is the typical cloud-blower type, with bulging sides. It is 8 inches long and $2\frac{1}{2}$ inches in greatest diameter, with a tapering hole $\frac{3}{8}$ of an inch in diameter and $\frac{3}{8}$ of an inch deep at the mouth-piece. At the large end a shallow bowl has been started by gouging instead of by drilling. Pipes were found on and below the floors of Late rooms; the unfinished pipe, *d*, came from below the floor of K, a room of the Transitional Period. Pipes were never placed in graves at Swarts. Cylindrical pipes of soapstone and short ones cut from porous lava also occur in the Mimbres country. Clay pipes are described on page 87 and illustrated on Plate 103.

Tablets or Plaques (Plate 56; Fig. 5): 17 perfect, 43 fragmentary; flat, generally rectangular with rounded corners; 52 of slate and shale, 8 of dense sandstone; length varies from 2 to 5 inches, width from $1\frac{1}{4}$ to $3\frac{1}{2}$ inches, thickness from $\frac{1}{8}$ to $\frac{1}{2}$ an inch.

They are made, presumably, from naturally tabular pieces of stone, worked to final form by grinding. The lower surfaces of half of them are plain but well smoothed; the edges are squared; the upper surfaces are flat and in all well finished specimens show signs of rubbing; in 2 cases (Plate 56, *g*, and Fig. 5, *a*) the rubbing is carried so far as to produce a pronounced concavity (pestle work?). The upper surfaces of 45 tablets are plain and 15 are ornamentally bordered. In only 1 (Fig. 5, *a*) is the ornamental border slightly raised as in similar objects from the Middle Gila;¹ in the same figure, *a'*, the reverse of *a*, shows ornamental scorings on the back. In 4, decoration is confined to notched edges; in 2, to plain undecorated borders defined by an incised line; 5 have framed borders decorated with edge notches, and 4 have borders showing parallel and cross-hatch scorings. The tablet *e*, Plate 56, has a notched and channeled edge (a channel showing more clearly at *b*, Figure 5). Figure 5, *b*

¹ Fewkes, 1912, *Casa Grande, Arizona*, Plate 60.

and *b'*, shows the face and back of an incised tablet. The specimen *j*, Plate 56, a re-used fragmentary tablet with its broken edge rubbed smooth, has decorative lobes or ears at the corners. The unfinished example, *m*, on the same plate, was apparently designed to possess similar ears, and the concept of corner projections or knobs recurs in certain stone dishes (Plate 25, *a* and *d*). The thin sheet of stone for

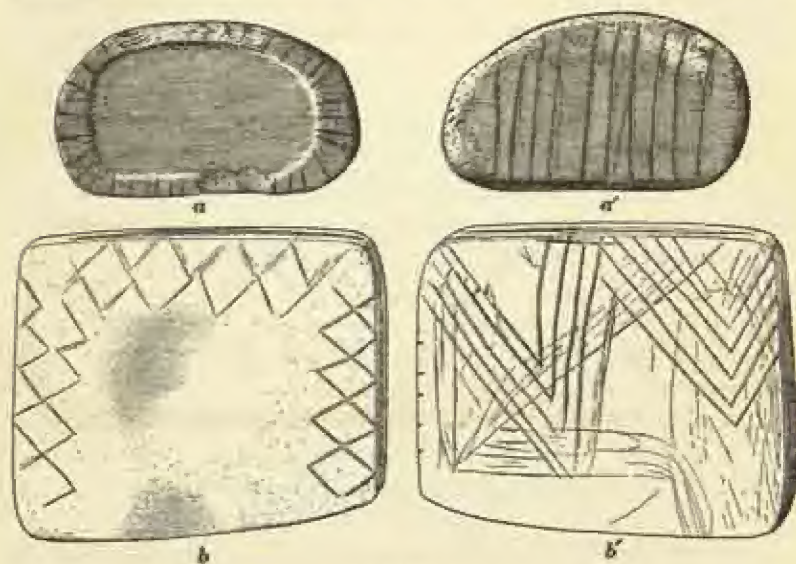


FIGURE 5

Stone tablets or plaques: *a'* and *b'* show the reverse of *a* and *b*. Specimen *b* is 4½ inches long

the tablet *k* (Plate 56) was doubtless chosen because it was already partially framed by a natural dark red discoloration in the rock.

The purpose of the tablets is problematical, but their elaborateness implies ceremonial employment. Only 2 are sufficiently abraded to suggest that they were used as paint-grinding hearths. Russel collected analogous specimens from a Pima medicine man, but does not state whether or not they formed part of his professional paraphernalia.¹ Fewkes mentions a tablet with raised border from Casa Grande, and says, "It is typical of many found in ruins in the Gila-Salt Valley and suggests a pigment slab."² He also de-

¹ Russel, 1908, *The Pima Indians*, p. 112.

² Fewkes, 1912, *Casa Grande, Arizona*, p. 123.

scribes a tablet from Pueblo Viejo, near Solomonsville, Arizona, which he identifies as a "ceremonial slab."¹

Fragments of 2 large thick rectangular tablets, with square edges and slightly raised plain borders $\frac{3}{4}$ to $\frac{1}{2}$ of an inch wide, were found. One was of tuff, 7 inches wide and $1\frac{1}{4}$ inches thick; the length could not be determined. The other was a corner of a sandstone tablet, $\frac{3}{4}$ of an inch thick. They are too shallow to be classified as dishes, but somewhat resemble the small slate tablets.

At Swarts 6 tablets were found with burials. Tablets came from the fills of 7 and below the floors of 20 Late Period rooms. They were also found below the floors of 2 Middle Period houses; and in 2



FIGURE 6

Painted stone object, 7 inches long.

Early plaster-on-soil pit-houses, 4 roughly shaped tablets were discovered below the floors.

Hough found a tablet at the Spur Ranch near Luna, New Mexico, and informs us of their distribution south of the Gila and into Mexico for an unknown distance.² He also states that they do not extend beyond the crest of the mountain ranges north of the Salt River Valley. Their westernmost limit is not known and their presence in the Mimbres Valley to the east increases their known distribution. As they have been found over such a wide area, it cannot at present be stated that they originated in the Mimbres, although tablets were found below the floors of the Early pit-houses at Swarts.

Painted Stone Object (Fig. 6). This unique oblong tablet is of sandstone, outlined on the edges with pink natural discoloration.

¹ Fewkes, 1904, *Two Summers' Work in Pueblo Ruins*, Part I, pp. 185-186.

² Hough, 1914, *Culture of the Ancient Pueblos of the Upper Gila River Region*, p. 31.

The panel is 7 inches long, 2 inches wide, and $\frac{1}{4}$ of an inch thick, and is roughly decorated in black with interlocking scrolls, zigzag lines, and circles.

Stone Bottle (Plate 29, *g*). The imitation bottle, the only example found, has a rounded jug-like body with the mouth slightly hollowed to enhance its resemblance to a container. It is cut from coarse grained tuff and is 9 inches high and $7\frac{1}{4}$ inches in diameter. It was found below the floor in the northeast corner of Pit-room AB. The bottle has no conceivable utility and is, therefore, probably to be identified as a ceremonial object, possibly once forming part of an altar set-up. If so, its presence in the pit-room would seem to indicate a relatively early development of elaborate cult practices. As far as is known, nothing resembling this specimen has ever been found in the Mimbres region.

Stone Caterpillar (Plate 29, *f*). This is a waterworn piece of lava whose natural resemblance to a caterpillar probably led to the pecking of irregular shallow channels on the sides to make a more realistic fetish. It is $17\frac{1}{4}$ inches long by 6 inches wide. The caterpillar was found on the floor of Late Room 62.

Miscellaneous Stone Objects (Plates 57 and 58). The ball (Plate 57, *a*) is of red lava, $1\frac{1}{4}$ inches in diameter, having a shallow channel encircling it and a cone-shaped hole drilled in one end; *b*, of chalky white caliche, has two incised lines encircling it; *c*, a flat sided shuttle-shaped object of the same material, is $2\frac{1}{4}$ inches long, and $\frac{5}{8}$ of an inch wide; *d*, of red rhyolite felsite, $2\frac{1}{4}$ inches long and $\frac{3}{16}$ of an inch wide, resembles *c*, but has a channel over one side and the edges. Both *c* and *d* resemble atlatl weights found in Basket-maker deposits. Specimens *e-g* are arrow straighteners, the only ones found: *f*, of schist, shows the effects of heating and the channel is highly polished. The other 2 are of limestone, with smooth, unpolished channels. These specimens were found on and below room floors, and were not associated with burials.

Arrow straighteners are not common in the Mimbres area. The bird of red lava, *h*, found at the feet of an infant skeleton, is $2\frac{1}{4}$ inches long. The reptilian forms, *j* and *k*, made of tuff, are 4 and $3\frac{1}{4}$ inches long respectively. The stone rings, *l-n*, also of tuff, were the only ones found. They average $3\frac{1}{4}$ inches outside diameter, and have had the centers cut out by chiseling from opposite sides, as

may be seen in *m*. The ring, *l*, has an incised line girdling it. There was no clue as to their possible use.

On Plate 58, *a* and *b* are 2 of the many small stone slabs found. They are made of fine grained sandstone, and are oblong and square in form, measuring 5 to 7 inches long, 3 to 5 inches wide, and $\frac{3}{4}$ to $\frac{1}{2}$ of an inch thick. They have flat, smoothly worn surfaces, and are tentatively identified as bead polishing or cutting stones since they could have been used in sanding down a string of rough bead blanks to uniform diameter. The stone ball, *c*, is 1 of 10 made of tuff or porphyritic rhyolite. These were pecked to shape, and range in size from $1\frac{1}{2}$ to $3\frac{1}{2}$ inches in diameter. Balls were found on and below floors and in room fills. They were probably used in games. Specimens *d* and *e*, of lava, were the only such objects that came to light. They suggest toy metates, but were probably used as pigment mortars, *d* being stained with copper carbonate. The specimen *f*, of light pink laminated tuff, is $6\frac{1}{2}$ inches in diameter and $\frac{3}{4}$ of an inch thick. The disc with a projection on the edge suggests the form of a turtle, an idea which is perhaps strengthened by the conventionalized angular and pointed heads of turtles depicted on Mimbres pottery (Plate 202, *f*).

Bone. Food bones, of which a plentiful supply was always available about a Pueblo village, were manufactured into serviceable tools with a minimum amount of labor. The first step in the process was scoring, then deepening the line by sawing with a sharp flint or a thin piece of sandstone with a sharpened edge, thus widening the cut in order to split the bone lengthwise, or to cut it transversely. The preliminary steps are illustrated in Figure 7; *a* shows the first light cuts around the circumference of the tibio-tarsus of a crane, which were afterwards deepened and the bone broken in two; on *b*, a discarded proximal knuckle of a deer femur, the cross section still retains the scarf marks of the stone saw which had completely severed the bone. Bone beads were cut from tubular bones in this manner with the ends either smoothed or left in a rough state. Plate 62, *a*, illustrates the longitudinal sawing back and forth in the median depression of the metapodial of a deer, in order to split it in halves, after which the sections were fashioned into awls and tools for different purposes. Figure 7, *c*, clearly shows the actual whittling of a bone with a sharp flint blade; delicate carving

with stone flakes is seen in the awls, Plate 59. Pointed tools were reduced and sharpened on abrading stones, on which the resulting wear may be seen in Figure 3, a, p. 40.

Nearly all the bone tools were made from the bones of deer and antelope, which were apparently numerous and easy to kill. The bones of coyote, fox, mountain sheep, elk, and bison are present, but not in sufficient quantity to have commonly been converted into tools. Wild turkeys were plentiful, yet the tubular bones from these or other birds were seldom used, only 2 awls of this kind



FIGURE 7

Process of scoring, sawing, and whittling bone.

having been found. With the exception of 20 awls made from deer and antelope ulnae, the majority of the 211 complete and fragmentary awls or punches, so far as recognizable, came from the metapodials of these animals. They were quickly pointed and sharpened on an abrading stone. There can be assigned to them no certain use other than as stiletos for puncturing and, in the case of those with blunt points, as tools for flaking stone. That they served daily in many other ways is indicated by the wear upon and the diversity of the shape of their points.

There was no discernible difference between awls found in Early and Late rooms. The specimens illustrated are typical of this region, and there seem to be no local peculiarities to differentiate them from similar tools found in other parts of the Pueblo area.

Decorated Awls (Plate 59). There are 10 in the collection. These are artistically carved to represent in a life-like manner the heads of mountain sheep or the whole bodies, through utilizing the distal end of the entire or split metapodial, which naturally lends itself to the fashioning of such handles. The handle of the awl *a*, was not split, but the sides of the condyle have been rasped off and a pair of hooks formed which probably represent horns; *b*, from another Mimbres ruin, is illustrated for comparison with *c*, from Swarts. In both instances one knuckle has been cut off to form the back of the animal, and from the other has been carved the head. Thus the entire body of the quadruped was produced. Ingenious use of a drill has given the proper crook to the legs of *b*. Heads on the handles *d-f* are carved from the one knuckle left by splitting the bone, and on *e*, a hole for the insertion of a thong was drilled through the top of the sheep-head ornament, meeting another perforation drilled at right angles to it through the center of one horn. Three awls similar to *g* have a socket cut in the joint on one side above the foramen, possibly for an inlay of turquoise or some other brightly colored stone. The neck of the joint is tapered and the tool shows a high quality of workmanship worthy of so unusual a decoration. The outlined cross on *j* appears on Mimbres pottery as well as on petroglyphs in the valley. The cross on the awl seems to have been produced by lightly scarifying the bone, followed by the application of a red dye which left a permanent stain that did not rub off as the handle became polished from use.

Awls Made from Ulnae (Plate 60). There are 20 unbroken awls made from the ulnae of deer and antelope, and many broken specimens were found in the refuse. The ulna, however, does not last as well in the soil as the metapodial bone. The knob resting in the palm makes an ideal handle when grasped with the second finger. New blades are slender and when shortened by wear are either re-pointed or left blunt for heavy duty. A tool in process of manufacture is shown at *e*; *f* and *g* have artificially flattened handles.

Awls Made from Complete Metapodials (Plate 61). A popular form of awl or dagger was made from the complete metapodial. By grinding away the proximal end, additional awls were sacrificed to produce a tool with a knob handle and stiff, concave shaft. The knob of *c* has been removed and the flattened end decorated with two incised crosses; *d* is a more finished tool with the knuckles

greatly reduced; *c* and *f* are awls that have been broken and re-sharpened.

Awls Made from Split Metapodials (Plate 62). The awl figured at *a* is half a metapodial, sawed along the median groove and split from the other half. By cutting the section at the center it is possible to make 2 awls of types *b-d* from the proximal end and 1 knob-handled awl, similar to *e-g* from the distal end. Plate 63 shows awls made from the distal ends of split metapodials; some points are slender and sharp, others blunt for heavy punching. From long use some awls have become short by grinding one side as on *a*, or both sides as on *g* and *h*; *c*, *d*, and *f* illustrate another method of resharpening by first notching the side and afterwards tapering the shaft to a slender point beyond the notch.

Awls Made from Split Bones (Plate 64). The awls are made from split metapodials, leaving the proximal end for a handle. With the exception of one slender specimen, the heads are left in the rough. Some points show the scratches of the abrading stone, while on others these marks have been obliterated by long use.

Awls Made from Bone Splinters (Plate 65). Great numbers were found. The plate shows awls made from bone splinters and slivers of large awls, only 2 showing secondary working. The bone *a* is so well rounded and so smooth that it would have been useful as a pin. The end of *c* is flattened to form a combination spatula and awl.

Awls and Flattened Bone Tools (Plate 66). The fragile awls *a* and *b*, made from tubular bird bones, were the only ones of their sort discovered; *c* and *d* are points of spatulae; *e-g* are flattened bone tools ground to a uniform thickness throughout, with narrow thin points; *h* is a combination awl and spatula; *c-h*, which represent all the spatulate tools in the collection, are possibly better fitted for making coarse basketry or for weaving than the round, pointed awl.

Awls and Notched Bones (Plate 67). The knuckles on the awls *h-m* are missing, as the bones from which they were made were of young animals and the caps had not fused to the shafts.

The serrated fragment of the lower mandible of a deer, *a*, suggests a rattle or noise maker; it is similar to the notched scapulae from Hawikuh, found by Hodge.¹ The teeth of the antler tips *b-g* are rounded and polished as though they had been rubbed with a

¹ Hodge, 1920, *Hawikuh Bonework*, Plates XLIII and XLIV, p. 138.

thin-edged object. Notched antler tips, when rubbed, would not produce as clear a rasping sound as would a notched scapula, and also the notches on the tips are too close to the end for this purpose.

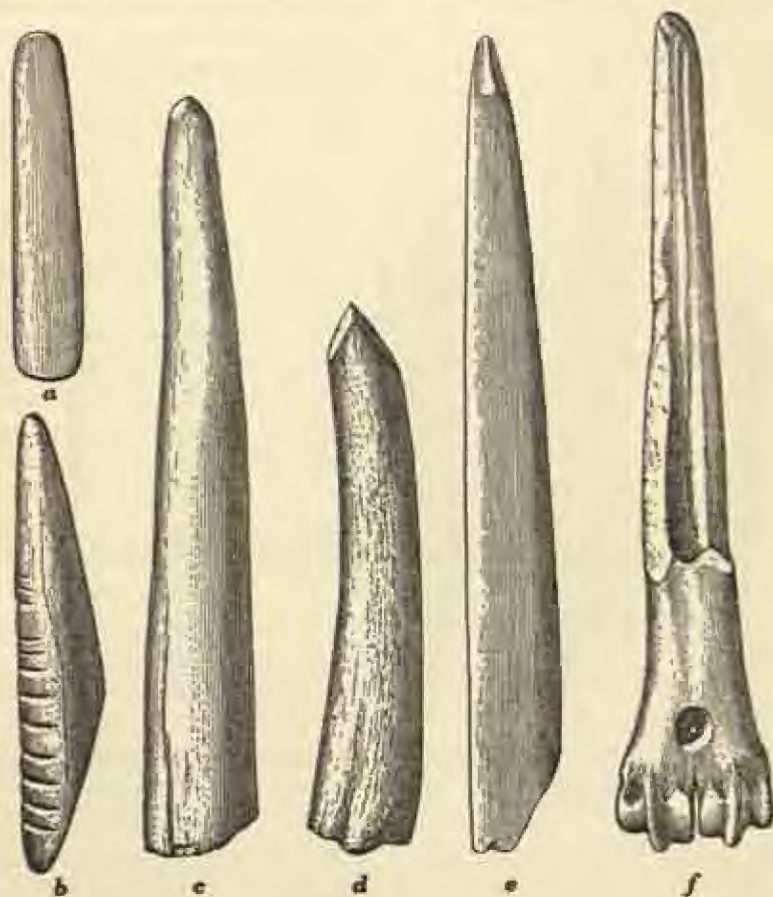


FIGURE 8

Flaking tools: *a-d*, antler tips; *e* and *f* from metapodials.
Specimen *f* is 6½ inches long

For these reasons their use is problematical. The antler tip *b*, which has a drill hole through its entire length, may have served as a haft.

Flaking Tools (Plate 68, *a-e*; Fig. 8). Those shown in Figure 8 are representative of several found. All show wear on the ends or a

finishing preparatory to their use for flaking. The tools *a-d* are made from tough antler tips. The fragment of split antler, *a*, with dressed edges and ends, is $2\frac{1}{4}$ inches long, too short to be held with the fingers in fashioning a stone point. It could only have been used after being lashed to a handle; *b*, a tip with butt end beveled on one side, the other end showing wear, has grooves on the side that would

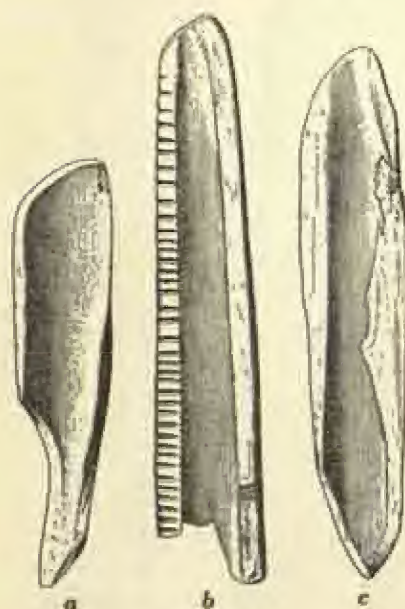


FIGURE 9

Rubbing tools of heavy bone splinters. Specimen *b* is $4\frac{1}{2}$ inches long.



FIGURE 10

Bone needle and pin. Specimen *a* is 4 inches long.

prevent its slipping in the hand when pressure was applied with the tool. The noticeable wear on the point of *c* indicates its use as a flaker; *d*, with a freshly resharpened end is beveled on both sides, leaving a smooth edge which could be placed accurately at a desired point on a stone to chip a broad flake; and *e* and *f* are broken metapodial awls, re-used as flaking tools.

Flaking tools made of heavy bone splinters (Plate 68, *a-e*) were plentiful and since they soon wore out, little attention was given to shaping them. Whether or not the tools were hafted can only be surmised. Their rough edges made it possible to bind them to a

stick when additional pressure with arm and shoulder was desired in flaking stone, as in the one figured by Guernsey and Kidder.¹

Scraping and Rubbing Tools (Plate 68, *f-k*; Fig. 9). Those made of animal ribs (Plate 68) probably served as knives, but the shape of many shows the effect of scraping and rubbing. Judging from the wear, some may have been used as potter's tools, but on others, particularly *f* and *j*, the worn edge is polished from contact with a material softer than the surface of a clay vessel.

The objects shown in Figure 9, *a-c*, represent 8 specimens of heavy bone splinters used as rubbing tools. Like the rib fragments, *a* and *b* have been held at right angles to the surface, and the edge has been polished by friction; the notches on the edge of *b* have not



FIGURE 11

Bone dice and gaming chips. Specimen *a* is $\frac{1}{2}$ of an inch long.

been polished as they would have been if used as a weaving tool. The end of *c* is rounded and slightly flattened, due to the fact that the tool has been held at various angles.

Needles and Pins (Fig. 10). Representing 1 of 2 bone needles in the collection, *a* is of bodkin form and is polished on both sides from use. It is 4 inches long, $\frac{1}{2}$ of an inch wide, and $\frac{1}{8}$ of an inch thick. In the same figure, *b*, 1 of several dewclaw bones of deer or antelope found, is polished through use as a pin.

Bone Dice (Fig. 11). A few bone dice appeared, unassociated with other objects in the excavations of houses. The oblong die, *a*, $\frac{3}{4}$ of an inch long, and the disc, *b*, $\frac{1}{2}$ of an inch in diameter, are duplicates of the bone dice found by Kidder and Guernsey in Kinboko Canyon.² As the reverse sides (*a'* and *b'*) show, both are scored, but have no pitch on them to indicate their use as inlays. The one at *b* is like the caps of compound dice, described by the

¹ Guernsey and Kidder, 1921, *Basket-maker Cases of Northwestern Arizona*, Figure 15, p. 97.

² Kidder and Guernsey, 1910, *Archaeological Explorations in Northwestern Arizona*, Plate 80, p. 189.

above investigators, from White Dog Cave near Kayenta.¹ It is not a bead, as the drill hole does not pass through the disc. The wide distribution of these small gaming bones in New Mexico is of interest, as they have been found at Pueblo Bonito,² the Rio San Francisco,³ and in the Mimbres area.

The oblong disc, *c*, $\frac{5}{8}$ of an inch long, resembles *a*, but is not scored on the back. The incised bone, *d*, is approximately $\frac{3}{4}$ of an inch square, and the fragment of rib, *e*, 1 of 2, is $\frac{5}{8}$ of an inch long. All seem to be gaming chips. There were 3 gaming pieces, duplicates of *e*, found in the Doolittle Cave, a Mimbres shrine; 2 of these were bound together with a cord.

Bone Tools not Appearing at Swarts. No bone implements with worn and polished grooves that could be classified as weaving tools were found at Swarts; nor was the true beveled chisel. Chisel-edged scrapers or fleshers made from deer humeri, the scraper or beamer of the metapodial or similar bones with sharpened edges formed by a longitudinal slot, were not developed. No notched scapulae or bone whistles have been found at this site or at other Mimbres ruins, so far as the writers know.

Jewelry. Offerings of jewelry placed with the dead, the disposition of these trinkets in graves, and their occurrence with children and adults, have been considered under the heading of burial customs, p. 28.

Process of Bead Manufacture (Plate 69). This plate shows a cache found with an adult male skeleton, 904, below the floor of Late Room 98; *a* represents fragments of beadellite in rough form as quarried, 2 to 2 $\frac{1}{2}$ inches long. The pieces were sanded down on a flat stone through the stages *b-d*, reducing them to plates less than $\frac{1}{16}$ of an inch in thickness. These thin plates were then scored with parallel lines and broken into strips which were snapped into rectangular pieces, *e*, averaging $\frac{3}{16}$ of an inch square; *f* shows blanks with $\frac{1}{32}$ -inch holes drilled with a fine stone point, similar to those in Plate 52 and Figure 12, *j*. The drilled blanks were presumably strung as shown in *f* and rubbed or rolled on a flat stone until they became round and were brought to a uniform diameter. The process is perhaps more clearly brought out by the detailed drawings in Figure 12. The ease of splitting slate and shale into sheets ob-

¹ Guernsey and Eddies, 1921, *Basket-maker Caves of Northeastern Arizona*, Plate 42, p. 106.

² Pepper, 1920, *Pueblo Bonito*, Plate 12.

³ Hough, 1914, *Culture of the Ancient Pueblos of the Upper Gila River*, Plate 25.

viously decreases the number of operations in making beads of that material.

Beads and Pendants (Plate 70). Series *a* shows dark gray beads

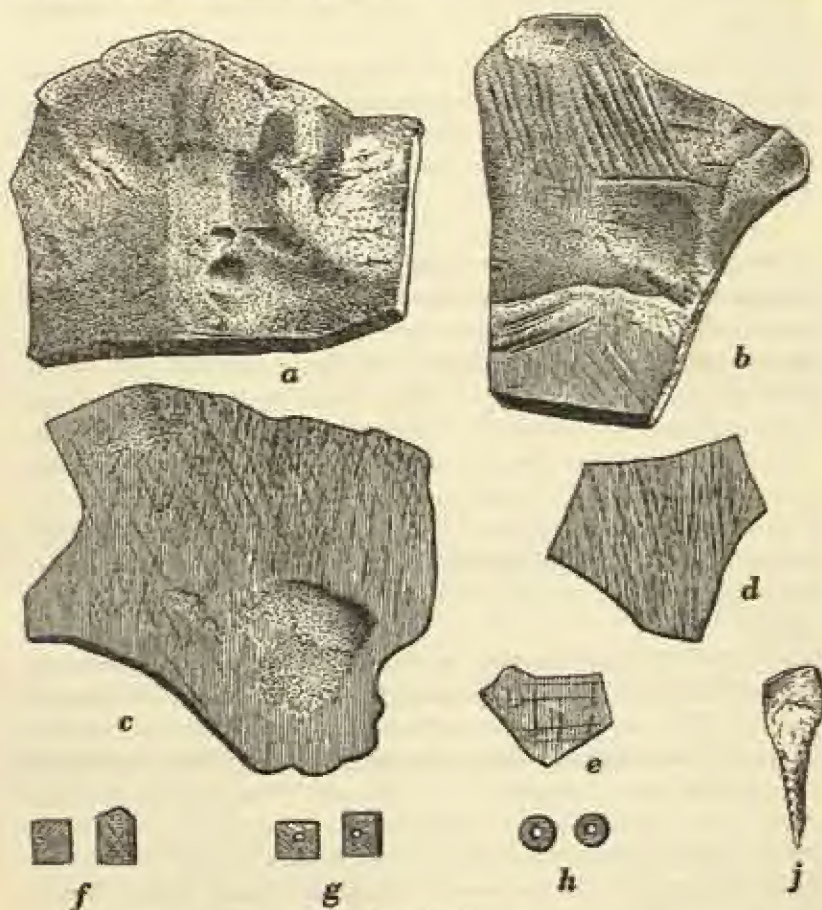


FIGURE 12
Series in bead manufacture from raw material to the finished product: *j*, type of drill used; *f-h*, drawn overalls.

which were found in quantity. They are discoidal in form, occasionally cylindrical, and measure slightly less than $\frac{1}{16}$ of an inch ($1\frac{1}{2}$ mm.) to slightly less than $\frac{1}{4}$ of an inch (5 mm.), a few slightly less than $\frac{3}{16}$ of an inch (7 mm.), outside diameter. The walls of the small beads are very thin. They take on a gloss from wear and

probably become darkened from oil in the human skin. Next in number are red discoidal beads of medium size. Dr. Kirk Bryan of Harvard University states: "The dark grey beads consist of clay which is probably related to the mineral, beidellite. The red beads are also clay which is probably the mineral, halloysite. The resemblance of this material to catlinite, the red pipestone of Minnesota from which the Indians made pipes, was very carefully considered. Catlinite is more coarsely crystalline than the bead material, which undoubtedly came from some locality not far from Swarts Ruin."

Series *b* represents the most prolific output of disc-shaped beads. These are made from easily worked fragments of *Glycymeris* shell and are not as small as the average dark gray beads, running from $\frac{3}{16}$ to slightly less than $\frac{1}{4}$ of an inch (4 to 5 mm.) and occasionally up to slightly more than $\frac{1}{8}$ of an inch (8 mm.) in diameter. Discoidal beads of stone and shell were found, in separate strands or strung alternately, around the necks of child and adult skeletons.

All but 2 beads in series *c* are shell; *c*, 1, which is of tubular bone, is 1 of only 3 found, $\frac{3}{4}$ of an inch to $1\frac{1}{2}$ inches long; *c*, 2, of *Vermetus* shell is 1 of 7, $\frac{1}{2}$ of an inch to $1\frac{1}{2}$ inches long; *c*, 3, and *c*, 6, are fragments of pink *Spondylus* shell (55 of these, in two lots, were taken from Early burials); *c*, 4, and *c*, 5, are complete and reduced *Olivella* shells. The latter shells were not common, having been found only with Early burials at Swarts, one strand as an anklet on a skeleton below the floor of Pit-room J, another with a burial on the floor of Early Room AG, and a third strand with an infant originally buried outside a house cluster and found below the fireplace of a house built in later times. Number 7 is 1 of 11 double-lobe shell and bone beads; double-lobe beads are found in the Mimbres, but not in profusion. Number 8 is of *Alectrion* shell, which was not used extensively at this village. In a cache farther up the valley, however, was found a quantity of them, and also of reduced *Olivella* shell beads (Plate 77). Fragile seeds like Number 9, Plate 70, *c*, were strung as beads and were preserved in graves by becoming impregnated with lime or some other element.

Series *d*, turquoise beads, were not found in great quantities. They vary considerably in thickness, from slightly less than $\frac{1}{8}$ of an inch (3 mm.) to slightly less than $\frac{1}{4}$ of an inch (11 mm.) in di-

ameter. Some are well made, others not perfectly round, probably because the material was valuable and waste was to be avoided.

Series *e*, turquoise pendants, are irregularly shaped and drilled fragments. There are 43 pendants in the collection, measuring $\frac{1}{8}$ of an inch to 1 inch long, of varying widths. All were well polished. They were used as ear-bobs, and were usually found one on either side of the skull. In only two places were a few turquoise inlays discovered, indicating that the mosaic art was known though not extensively practiced. By trenching and digging large pits, the aborigines mined turquoise in the Burro Mountains, thirty-one miles west of the Mimbres Valley.

Series *f* shows pendants of tuff, red chalcedony, schist, pink



FIGURE 13

Incised pottery pendant.

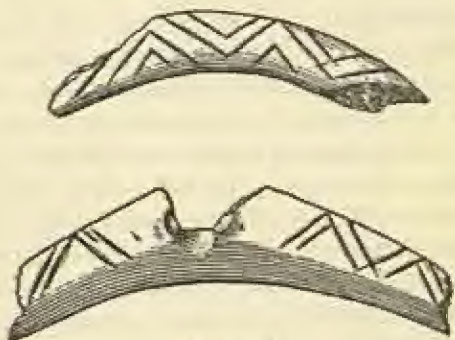


FIGURE 14

Fragments of incised *Glycymeris* shell bracelets.

sandstone, and white rhyolite. The scallop-edge pendant is $1\frac{1}{2}$ inches long. Figure 13 illustrates an incised pendant made from a fragment of pottery.

Ornaments Found with Burial 308 (Plate 71). The offerings found with the Late adult male burial, 308, consist of 41 *Conus* shell tinklers, $1\frac{1}{8}$ to $1\frac{1}{2}$ inches long, over 5000 discoidal shell beads, and 4 turquoise pendants. The jewelry lay on the chest and around the neck shown on the plate: sawed slot, slot and drill hole, and straight drilling. Only 3 other tinklers were found at Swarts, but they have been taken from other sites on the Mimbres. Inverted over the skull in this grave was the Chupadero black-on-white bowl (Plate 107, d).

Shell Bracelets (Plates 72 and 73). Of these, 125 complete and

over 100 fragments were found. They were made from *Glycimeris* shells, measuring $1\frac{1}{2}$ to $3\frac{1}{2}$ inches in diameter, and were manufactured by cutting away the body of the shell, leaving the edge as a ring (Plate 72, *f*). Small bracelets were sometimes made by rubbing the shell on a stone. These ornaments were occasionally decorated with incised lines, as shown on the fragments, Figure 14. Bracelets were found with 30 burials of infants, children, and adults: 1 bracelet each in 15 graves, 2 to 4 in 11 graves, 7 and 8 in 2 others, and the unusual numbers of 26 and 39 with 2 burials. There were 10 *Glycimeris* shell bracelets on the right arm and 16 on the left arm of the much decayed skeleton of an Early Period adult, Burial 389. Other offerings in this grave were: 39 rough drilled pieces of *Spondylus* shell, 104 irregularly shaped turquoise beads, and a Bold-face decorated bowl (Plate 108, *d*). On Plate 73 are shown *Glycimeris* shell bracelets, 12 of which were on the right and 27 on the left arm bones of the Early Period adult, Burial 442. In this grave were also 16 drilled pieces of *Spondylus* shell, a turquoise pendant, 273 rough turquoise beads, a crude corrugated jug (Plate 91, *o*) and three Bold-face bowls (Plate 109, *e*, Plate 112, *a*, and Plate 119, *b*).

Shell and Stone Carving (Plate 74). There are 21 shell pendants and gorgets in the collection (*a-l*), made from fragments of *Glycimeris* shell bracelets. They are either left plain or carved to represent lizards, rattlesnakes or pairs of wing-like figures (*k*). Specimen *c*, with another identical pendant, formed a pair. The objects *f* and *f'* are not drilled for suspension; they are carved to face right and left and polished as if they had been carried in a pouch as talismans. These ornaments were found in fills and on the floors of rooms; *c*, and its mate, and a few of the plain ones occurred as offerings in graves. Of the shell objects, represented by *m-p*, there are 9 specimens in the collection, all bird forms made of shell. The bird *q* is of gray soapstone; *r* of polished serpentine. The quail, *s*, appeared with another as a pair, cut from white soapstone. The eyes are represented by an extremely small drill hole through the head, outlined on both sides by an engraved ring. The lizard, *t*, is of glossy brown shell. Specimens *r-t* came from graves. Although there can be little doubt that they were used as ornaments, the form of several objects shown on this plate suggests that they may also have been amulets, which in the minds of their wearers possessed some magic power.

Finger Rings and Earrings (Plate 75). There are 3 finger rings; *a* and *b* are of bone, polished from wear; *f* is an incised ring of travertine limestone. The stone *e*, of the same material, is a finger ring in the process of manufacture; the stone is $2\frac{1}{4}$ inches long and $\frac{1}{2}$ an inch thick, with an $\frac{1}{4}$ -inch hole beveled on the edges with a tapering reamer; both sides of the stone are rubbed smooth. At *c* is an earring made from the same stone in imitation of the *Glycimeris* type of shell earring, *d*.

Jewelry from N A N Ranch Ruin (Plate 76). The shell objects, turquoise beads, and pendants accompanied a child burial at the N A N Ranch Ruin, a Mimbres site three miles below Swarts. Specimens *a* and *a'* are 2 carved shell birds with shell beads cemented to the head for eyes; an inlay of a hemispherical-shaped piece of turquoise is set in the base with the flat side flush with the shell. The carving shows a bird resembling a pelican mounted on a club-like object. At *b* are 3 turquoise beads; at *c* and *c'*, 2 shell gorgets which suggest a pair of wing-like figures like that shown on Plate 74, *k*. Similar trinkets carved from stone are found in the Mimbres area. At *d* are 2 turquoise pendants; *e* and *f* are shell figurines, *e* being $3\frac{1}{2}$ inches tall. The shell objects still retain a pink color in places.

Medicine Man's Outfit (Plate 77). The bowl, *a*, which contained the objects is $6\frac{1}{2}$ inches in diameter (reduced in reproduction). The cache was found by a Mexican in an arroyo near a ruin in Ancheta Canyon, tributary to the Mimbres River, twelve miles above Swarts. There are no other data. On the plate, *b* shows *Alectrion* shell beads from the Gulf of Mexico; *c*, reduced *Olivella* shell beads from the Gulf of California; *d*, a fragment of stalactite $3\frac{1}{4}$ inches long; *e*, a malachite pendant backed by matrix; *f*, 2 pieces of yellow oxide; *g*, pieces of shell bracelets; *h*, quartz crystal; *j*, lead ore crystals; and *k*, points of agate, flint, felsite, and obsidian, $\frac{2}{3}$ of an inch to 2 inches long.

Textiles. Decay had destroyed all but two small specimens of textiles which had been preserved by carbonization. One was a fragment of a woven yucca sandal of diagonal over-and-under weave, that immediately crumbled; the other, a small piece of coiled basketry with two-rod-and-bundle foundation (Fig. 15). The basketry fragment is $\frac{1}{4}$ of an inch wide and $1\frac{1}{2}$ inches long.

In one grave, the impression of a rather coarse cloth, presumably

of cotton, was visible in the soil below the body, but the dirt was not packed hard enough to leave a clear imprint from which the weave could be determined.

Paints and their Preparation. The pigments selected by the Mimbrenos for the decoration of pottery and other objects were relatively few, yet the variety of shades obtained was quite extensive, due probably, in the case of pottery, to the effects of firing and to the presence of certain impurities contained in the paints themselves. The Mimbres country is heavily mineralized, and the collection of pulverized and unground pigments found in houses and occasionally in graves shows by its great variety that no one mineral outcrop was quarried. The authors have never seen or heard of

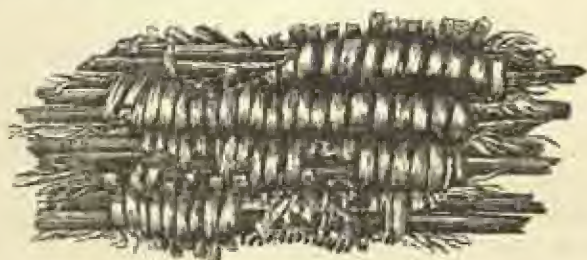


FIGURE 10

Carbonized fragment of basketry.

places where actual mining operations have been carried on by the aborigines to extract minerals suitable for paints. It was unnecessary to dig for them since so much of this material is to be found as float on the surface or in exposed banks or outcrops. The trenching and pitting to reach the veins of turquoise-bearing rock in the Burro Mountains is the only instance known in the district in which an approach to actual mining was made by these people.

In the unfired state, red ochers shade from a pale brick color to a rather bright red, and from this to the dark red of magnetite. The latter, however, was not much used, hematite having been more extensively gathered. The yellow ochers shade from pale to dark yellow. In two instances pulverized iron sulphite (jarosite) was found on room floors, evidently having been mistaken for yellow ocher. No cakes of vegetal paints were found, which fact may be explained by the decay of such substances in the soil. Two caches

of black pulverized material from rooms were at first thought to be prepared vegetal paint, but the substance proved, on analysis, to be the manganese minerals, pyrolusite and hausmanite. It is evident that this ore was not locally used in the decoration of pottery, since tests of the black paints on vessels commonly show a mixture of carbon and red iron oxide. Queerly enough, no kaolinite, either pulverized or in a rough state, was found in the ruin, although clays of this kind are to be obtained in the country and were used as a slip on all the Mimbres painted wares. Several large pieces of caliche were dug out of houses; but this substance, containing about 60 % of calcium carbonate, was not suitable for a pottery slip. Other pigments recovered in considerable quantity, which would not hold up under firing, were the pale green and blue copper carbonates, malachite and azurite.

The above list of paints, with the possible addition of soot, makes up the assortment of stable and unstable colors. All but caliche and the copper carbonates were used for pottery decoration, while the entire list served for the painting of wood and stone objects, as has been proved through specimens found in the dry caves and shelters of the district. Some of them were probably also employed for painting the face and body in ceremonial dances.

As shown by the flat surfaces on the chunks of ore and clay, the paints were reduced by being rubbed on an abrading stone. That they were also pulverized in mortars and on metates is evidenced by the colored powder still adhering to such implements. After these operations, the ground colors were often moistened and moulded into cakes to be stored for future use. Unfortunately, the absorption of the soil had so thoroughly destroyed all unfired vegetal dyes or paints that the first stages of their preparation can only be inferred by the finding of muller-shaped crushing implements and other stone tools whose working faces are unabraded and which may, therefore, have been used to crush such soft material as roots and plants before steeping them to extract the dye they contained. The use of vegetal pigments changed by subsequent firing to permanent carbon deposits has been proved by tests made of the paints used on the Mimbres wares.

POTTERY

The ceramic collection from Swarts consists of 963 catalogued specimens, mostly mortuary vessels, and many thousand sherds. Both categories of material were, of course, used in establishing the following general classification:

Black-on-white Ware
 Mimbres Classic
 Mimbres Bold-face
 Polychrome Ware
 Red or Brown Wares
 Corrugated Wares

The following tabulation gives the proportion of the different types and subtypes of pottery in the collection of whole or more or less complete vessels. The figures naturally do not reflect the actual proportions of the various wares in use at the pueblo for, as has been said, the material is largely mortuary; culinary vessels are, therefore, poorly represented.

BLACK-ON-WHITE	769
Classic	
Bowls, interior geometric design	408
Bowls, interior naturalistic design	227
Bowls, plain white slip, painted rim	15
Bowls, plain white slip, unpainted rim	5
Seed bowls, geometric design	13
Ollas, geometric design	19
Effigies	4
	691
Bold-face	
Bowls, interior geometric design	69
Bowls, interior naturalistic design	9
	78
POLYCHROME	8
Classic	
Bowls, interior geometric design	2
Bowls, interior naturalistic design	6
	8

IN SOUTHWESTERN NEW MEXICO

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RED OR BROWN		69
Red-wash		
Bowls	14	
		14
Incised		
Bowls	7	
Ollas	3	
		10
Plain Brown		
Bowls	28	
Seed bowls	5	
Jugs	18	
Ollas	11	
Ladies	8	
		70
Spiral-rub		
Bowls	3	
Seed bowls	2	
		5
CORRUGATED		55
Bowls	2	
Jugs with corrugated neck	26	
Ollas with corrugated neck	16	
Jugs with all-over corrugation	9	
Ollas with all-over corrugation	2	
		55
PIPES		32
Total		268

Clay. The clay beds adjacent to Swarts have not been located, but the clay used in Mimbres pottery is well distributed throughout the area. There are outcrops of shale and slate in many places, as well as deposits in the valley, of red and yellow clays which would fire well. A dark, sticky, red clay, which seems to derive its color from a disintegrated red lava cap, has been washed from an adjacent hill and underlies part of the Swarts Ruin. The run of Mimbres clay produces a paste of characteristic texture. It was carefully kneaded and tempered for the manufacture of decorated wares. For cooking vessels a more loosely knitted mixture of the same clay was utilized. It may be suspected that it was learned that the coarse paste of the cooking pots allowed for expansion and contraction, thus preventing checking when they were subjected to heat. Similar clay similarly handled is not confined to this valley,

for sites containing typical Mimbres pottery are found on the Gila River, sixty miles to the northwest.

Wash. The red wash seen on some of the red and brown wares is pulverized hematite, which is common throughout the area.

Slip. Kaolinite for white slip is to be found in Bear Creek Canyon, north of Silver City. Other deposits of white clays undoubtedly occur in the region.

Black Paint. Following the methods devised by Miss Hawley, we have made chemical tests which confirm her identification of the black paint on Mimbres pottery as a compound of carbon and iron (Miss Hawley's Type 3).¹ Overfiring often burned off the carbon to produce a most pleasing effect, the blacks merging into various shades of red (Plate 1, Frontispiece).² In some instances the heat has been so well applied that the result of overfiring has been to change the entire black design to a uniform reddish-brown or a bright red.

Black-on-white Wares. *Classic Black-on-white Inside Decorated Bowls* (Plates 81-84 and 121-232): 408 with geometric design (Plates 81-83 and 121-191); 227 with naturalistic decoration (Plates 84 and 192-232); majority of bowls 7 to 11 inches in diameter; extremes in diameter 3 inches and 15½ inches; 13 flower-pot-shaped vessels included in count of black-on-white bowls with geometric design (Plate 83, e); diameters 3¾ inches to 10 inches; depth 1½ to 5 inches; 15 undecorated white-slipped bowls with painted rim edge and 5 with unpainted rim, corresponding in form and size to the standard round-bottomed, decorated bowls; walls from ⅜ to ½ of an inch in thickness, with a few ⅝ of an inch thick; edges of rims round.

The outsides and insides of the bowls have been well smoothed with polishing stone. The paste is friable and not strong, less dense and hard than the pottery of the Upper Gila, and when struck has a dull sound, lacking the ring of northern black-on-white ware. It contains a large amount of fine to medium-fine quartz sand tempering, which is occasionally specked with grains of black sand (magnetite) from the stream beds. Small flakes of mica can be seen in the paste but not in sufficient quantity to be considered a tempering element. This paste fires from light gray to a gray-black, also from a yellowish-gray shading to a soft red brick.

¹ Hawley, 1929, *Pigments in the Southwest*, p. 736 and p. 745.

² This change in color is seen in both the Classic and Bold-face groups of black-on-white pottery.

The slip applied to a smooth stone-rubbed surface is commonly a flat white; occasionally, when containing a small percentage of oxide of iron, it is a dead cream color. In a few instances firing has turned the white slip to a blue slate color. The slip usually has been wiped on heavily enough to form a good background for design; it does not have the luster of the slip of Tularosa wares. Some pieces, thoroughly sun-dried, but unfired, were at times given a secondary rubbing with a polishing pebble to produce an added gloss.

In construction there is no evidence of increased thickness or of uncrased imprints at base to indicate the formation of vessels by pressing a cake of clay into a mold. Coiling of a continuous rope of clay from the bottom was evidently the normal process of manufacture. This is indicated by the bowl illustrated on Plate 81, *e*, whose wide corrugations on the outside have not been obliterated by the potter's tool. Additional evidence of the coiling technique is provided by study of killed bowls. In such specimens the striking of the center with a stone often left a circular opening, the result of breaking the contact between coils; furthermore, the remaining fractures surrounding the kill-hole at times assumed a spiral form (Plate 81, *h*).

The forms of bowls may be seen on Plate 78. Round bottom bowls, *l-r*, which are in the majority, are generally less than half a sphere; a few are hemispherical. The flower-pot shapes, *s-w*, have flat bottoms and nearly straight flaring sides. In both types the rim is the same thickness as the walls. In the globular bodied bowls, *a-f*, with slight to pronounced flared rim, there is an additional thickness at the bottom of the flange which is more noticeable on the inside than on the outer surface of the vessel. The bowl *g* is an uncommon elliptical form. A few such dishes with indented ends were found (Plate 88, *f* and *g*). The shape *h* (Plate 78), incurved at the top, is found in both decorated and plain bowls; *j* and *k* are variants of *h* with the wavy rim; *x-z* illustrate the common form of the seed bowl in plain, spiral-rub, and painted wares.

Classic decorated bowls are characterized by accurate, fine-line brush work (Plate 85) in both geometric and naturalistic styles; by painted rims; by multiple parallel line borders (the so-called broken life line does not occur in the Mimbres area); by rarity of outside decoration (Figure 16 shows a few outside decorations found on bowls with interior decoration); by blending from black to red in the design as a result of overfiring (Frontispiece); by overruns of slip

on the outside near the rim (Plates 81, *d*, and 82, *a*); by occasional zigzag smears applied to the outsides of bowls by fingers dipped in the slip; and by unslipped exteriors of bowls, the exposed paste varying in color from creamy-gray to buff.

The decoration of the Mimbres Classic pottery falls into two main classes, geometric and naturalistic, the former predominating. The geometric decorations are diversified by many combinations of designs, no two of which are alike (Plate 191). Naturalism is somewhat conventional. It was brought to a high degree of perfection,

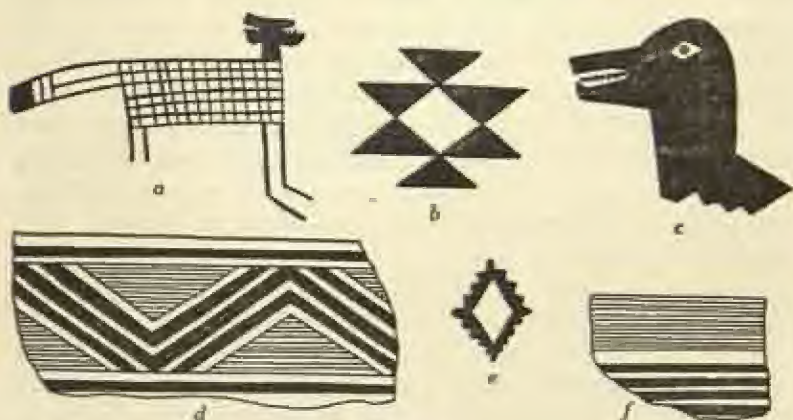


FIGURE 16

Some of the few exterior decorations on bowls from Swarts Ruin: *a*, outside of bowl shown on Plate 118, *c*; *b*, sherd with scroll design interior; *c*, outside of intricate geometric design sherd; *d*, white slip interior with no decoration showing; *e*, geometric interior; *f*, fine lines covering the entire surface of the interior.

both in positive and negative drawing, for the depiction of animal and insect life. Representations of the human form and features are less well drawn, though they show action and record events with accuracy. Naturalistic figures are usually framed by bands or combinations of geometric units which form panels for the objects illustrated.

Black-on-white Seed Bowls (Plate 83, *g*): 13 complete and fragmentary pieces; diameters 4 to 7 inches; orifices $\frac{1}{2}$ the diameter, or more, of the bowl; built by coiling; walls $\frac{2}{8}$ to $\frac{1}{4}$ of an inch thick; edge of rim rounded.

The exteriors have been stone polished and the interiors smoothed with fingers. The paste, slip, and pigments are the same

as in Classic black-on-white bowls. The outlines (Plate 78 *x-c*) show tops of bowls rounded. The design characteristics are: edge of rim painted; band of geometric design encircling the bowl near the rim or below it; and band unframed, or framed with single or double lines, occasionally having only double lines at top of band or only a single heavy line below it.

Classic Black-on-white Decorated Ollas (Plate 83, *d* and *h*): 8 complete, 7 fragmentary; large ollas, 10½ to 15 inches in diameter, 9½ to 13 inches in height, 3½-inch to 5½-inch orifice; 1 broken olla with unusual great diameter of 17 inches; small ollas 2¾ to 6½ inches in diameter, 3 to 6 inches in height, ¾-inch to 2¾-inch orifice; greatest diameter of ollas approximately the same as height, with inside diameter of orifice about ⅓ the diameter of body; small ollas furnished with perforated lugs; edge of rim rounded; rim outcurved; short neck; full bodied effect with rounded shoulder; bottom usually rounded, at times resembling the narrow end of an egg (outlines and additional designs on Plate 79); built up by coiling; walls ⅜ to ⅝ of an inch thick.

The outsides have been polished with a pebble; the insides well smoothed with fingers and sometimes rubbed with a stone. The paste is same as in Classic black-on-white bowls; the dull white slip covers the paste well, and the slip thins below the shoulder to an unslipped bottom. Pigments and the result on them of firing conditions are the same as on black-on-white bowls. The edge of the rim is painted with bands of geometric decoration on the breast, commonly framed with wide single or double lines, but sometimes unframed or having one or two wide lines below.

Classic Effigy Jars (Plate 87). Black-on-white Mimbres effigy jars (*a-g*) are extremely rare. Specimens *a* and *b* have projections on the side of the olla neck to form human ears. A portion of the painted diamond-shaped eye in front of the ear on *a* confirms the identification. Both bear a resemblance to designs on Casas Grandes, Chihuahua, vases. The small oval bowl, *c*, is more elaborate with a well modeled mountain sheep head on the rim at one end, and the tail on the opposite rim. Progress toward a true effigy is seen in *d*, the fragment of a water bottle with cat-like head, having a circular mouth out of which liquid could have been poured. The head of the true effigy, *e*, has the appearance of a squirrel, but the notched horns suggest those of an antelope. The effigy *f*, with curved horns, appears to represent a mountain sheep. The dog, or

rodent head, *g*, is hollow and probably was part of an effigy jar. A hole has been drilled at the back of the neck so that it could be used as a pendant. These vessels were fashioned by coiling, and the clay, slip, and paints are the same as those of the black-on-white wares. The pigment fires with shadings from black to red. Geometric designs cover the visible surfaces of the vessels.

The rim sherds *a-b*, and specimens *d-f*, with fragments of other effigy jars, were found in a deposit of broken pottery not associated with a burial. They seem, for some unknown reason, to have been thrown into a hole and intentionally destroyed. The effigy jar, *h*, the water bottle, *j*, with animal lug, and the slipper or bird form jar, *k*, are trade pieces from the north; they were found in Late Period rooms.

Bold-face Black-on-white (Plates 86 and 108-120). Like the decorated bowls of the Mimbres Classic black-on-white, these distinctive Bold-face bowls were built by coiling, and resemble them in form and range of size. At Swarts, bowls predominate. No seed bowl shapes (with the possible exception of the bowl shown at Plate 148, *a*) were found here, and in only four instances did the sherds of ollas come to light. Bradfield illustrates a complete seed bowl and an olla of this ware from his Cameron Creek site.¹ The paste is more carefully kneaded than is that of the Classic ware; it is harder, and meticulous use of the polishing pebble before and after the slip was applied has produced a soft, satiny-feeling surface. The results of polishing may be seen not only on the interior of the bowl, but also, and even more distinctly, on the outer surface where overruns of slip have been spread by the stone. The decoration of these bowls is characterized by bold designs extending to the rim, by figures resembling a double flag or stalked triangles (Plates 86, *d*, and 114, *a-b*), and by coarse waved and straight hachure with wide framing lines. When interlocking scrolls were drawn in conjunction with straight-line designs, the heavy brush work persisted. Naturalistic figures are crude and unrealistic; such, however, as do occur are easily recognized as belonging to this type.

A Commentary on Mimbres Black-on-white Wares. There occurred at Swarts, as has been shown, two varieties of black-on-white pottery, the Mimbres Classic and the Mimbres Bold-face. We do not hesitate to distinguish between them, for they are markedly different, both in decoration and in finish. In considering

¹ Bradfield, 1931, *Cameron Creek Village*, Plate XXXI, 131-28 and 377.

their relationships one would naturally suppose, in such a case, that one of them must have been older than the other.

It is well to preface further discussion on this point with the statement that stratigraphic conditions at Swarts were extremely bad. The digging of pit-houses, the haphazard scattering of refuse, and particularly the constant sinking of grave-shafts, resulted in a continual churning of the earth during the entire occupancy of the site. Not a single clearly stratified heap could be located. Nevertheless, the writers made every effort to recover data as to the relative age of everything found, and special care was exercised in collecting and keeping separate the fragments of pottery from above and below the floors of rooms. The accrued mass of sherds was sorted at the Museum and the Classic and Bold-face specimens were counted. The results appear in the two subjoined tabulations, in the first of which are included the sherds from above (+) and below (-) the floors of the rooms. In the second tabulation, prepared to present the same material in somewhat shorter and perhaps more significant form, the sherds from below the floors of any given period are grouped with those from above the floors of the preceding period; the sherds from above Late floors and from below Early (pit-house) floors are, of course, listed as in the first tabulation.

Origin	Number of Sherds		Percentages	
	Classic	Bold-face	Classic	Bold-face
Late +	8,174	150	98.19	1.8
Late -	13,744	830	94.3	5.69
Middle +	407	20	95.3	4.68
Middle -	223	74	75.00	25.00
Trans. +	383	59	90.8	9.16
Trans. -	21	6	77.7	22.2
Early +	221	21	91.3	8.6
Early -	33	7	82.5	17.5
Totals	23,408	1,167	93.25	4.75

Origin	Number of Sherds		Percentages	
	Classic	Bold-face	Classic	Bold-face
Late +	8,174	150	98.19	1.8
Late -	14,161	850	94.33	5.66
Middle +				
Middle -	808	133	85.86	14.13
Trans. +				
Trans. -	242	27	89.96	10.03
Early +				
Early -	33	7	82.5	17.5
Totals	23,408	1,167	93.25	4.75

Study of the tables indicates that both Classic and Bold-face were in use at the settlement from beginning to end, with Classic always strongly in the majority. The tables, however, also show that Bold-face was present in definitely greater relative abundance in early times than it was toward the end. In the latest period, represented by the fragments discovered above the floors of the pueblo proper, Bold-face falls away to less than 2%, a proportion so small as even to suggest that it had practically passed out of current service, and that the fragments found there were due to breakage of heirloom vessels, to inclusion in late fills of material dug from earlier deposits, or to old sherds mixed in wall adobe.

Turning to the evidence of the graves, we find that 61 interments (or 6% of the total of all burials) contained 1 or more Bold-face bowls. Of these, 3 lay below the floors of Early Period plaster-on-soil pit-houses, 1 below a Transitional Period combination plaster-on-soil and rubble-wall pit-house. No skeletons with Classic bowls occurred, it should be noted, under any of these oldest structures, the first graves with Classic bowls appearing beneath Middle Period dwellings. Among the skeletons at this level were 2 which were accompanied by both Classic and Bold-face offerings, while 4 such mixtures occurred in graves under Late Period houses. Depth of graves and nature of soil in which they were dug seem to be of no significance, both Bold-face and Classic interments having been found at from 2 to 9 feet below the surface and in black earth, gravel, sand, silt, and red clay.

It is clear, from the preponderance of Classic sherds (82.5%) even under Early Period floors, that this ware was already in the ascendant when the first people settled at Swarts. The absence of Classic pottery from the oldest graves might, however, be taken to indicate a former supremacy of Bold-face. And that Bold-face was on the decline in later times is surely proved by its unmistakable fading out in the sherd-content of the highest levels. At the time of the founding of Swarts there may have been two schools of potters, representing a somewhat earlier amalgamation of two groups of people; or Bold-face may have been actually the older type of pottery, in process of being supplanted, when the villages came to this site, by Classic. The problem presented by these two distinct ceramic styles is, at all events, well-defined. Now that it is recognized, future research may serve to solve it.

Bradfield's sequence in pastes: ¹ Early Red, Early Gray, Early White and Ashy Gray, is illustrated by plates of sherds which show, with but 10 exceptions, all Bold-face pottery decoration. His Late Coarse Gray pastes are illustrated by Classic fine-line decorated bowls.² This, of course, serves to rank the Classic as the latest at Cameron Creek.

We have attempted to seriate our material on the basis of Bradfield's paste classification, but without success, for we find what appear to us to be cases of two and three of his paste types (as identified by color) occurring in many single bowls, both Classic and Bold-face. We do not doubt the validity of Bradfield's determinations, as we are fully aware of the meticulous accuracy and conscientiousness of everything he did. His work, however, was based on studies much more detailed than we have been able to make; and his results, therefore, rest upon criteria which we are not competent to use. His death prevented his classifying his pottery by design (which he told us he was planning to do), hence he of course did not correlate his pastes with the phenomena of decoration, and his ranking of the Cameron Creek pottery by paste (as it appears in his incomplete posthumous report) is therefore not comparable to our grouping by design of the vessels from Swarts. It is to be hoped that some one who possesses a keen sense of technological values may carry forward the important research which Bradfield began.

Polychrome (Plates 192 and 193). A small percentage of designs, both geometric and naturalistic, are embellished with fills of color varying from light brown to creamy-buff. Polychrome was found only in the Classic designs at Swarts, and we have never noted, in other Mimbres collections, an instance of this treatment of Bold-face designs.

Red or Brown Wares. *Plain Red-wash Bowls* (Plate 90, c): 14 found; commonest forms average about 5 inches in diameter, extremes 3 and 13½ inches; formed by coiling; walls $\frac{1}{8}$ to $\frac{3}{12}$ of an inch thick and brought to rounded edge, without increased thickness at rim.

The bowls have been polished with a pebble, from medium to glossy finish. The paste is hard and fine grained in the polished bowls, and medium-coarse in pieces not so well finished. A thin to

¹ Bradfield, 1931, *Cameron Creek Village*, Plates XX-XXIV.

² Bradfield, 1931, *Cameron Creek Village*, Plate LVII, 303; LXVI, 314; LXVII, 234 and 427; LXXXI, 133-28.

heavy wash of red oxide of iron produces a warm brown to rich maroon colored surface. A slip or wash is applied to the inside or to both inner and outer surfaces. If applied to the inside, the wash runs over the edge of the bowl, while occasionally only the visible surface of the exterior is tinted. Specimens are shallow to hemispherical in form, some with contracted rim producing an incurved top.

Incised Bowls (Plate 90, *j*): 7 in collection; 8 to 9 inches in diameter, 1 miniature bowl $1\frac{1}{2}$ inches in diameter (Plate 89, *a*); constructed by coiling; walls $\frac{3}{16}$ to $\frac{1}{4}$ of an inch thick; unthickened, round-edged rim.

They are well polished inside and out, and the polishing stone, in smoothing over incised lines, has formed a burr on the edge of the trough. The paste is friable with medium-coarse sand tempering, and fires to a red brown. The bowls are without a wash. In outline they are slightly less than half a sphere. Decoration on the outside, at or below the rim, consists of a band composed of triangles with opposed scored hachure.

Incised Ollas (Plate 92, *e-g*): fragments of only 3 found; diameter of *e*, 12 inches, estimated height $12\frac{1}{2}$ inches (diameter and height nearly the same); orifice $8\frac{1}{2}$ inches; built by coiling; walls uniformly $\frac{3}{16}$ to $\frac{1}{4}$ of an inch thick throughout; edge of rim rounded.

The vessels are smoothly polished inside and out. The paste has fired hard, as in the red-slipped bowls, and the tempering is fine to medium-coarse. Two specimens were given a thin wash of red oxide of iron, which brightens the reddish brown clay. The ollas have a full rounded body and short neck with outcurved rim. No fragments of bases were found, but they presumably have approximately the same curvature as other Mimbres ollas. The decoration at times starts very close to the rim, but usually a smoothed band separates it from the edge. The decoration of *e* is a herring-bone pattern, formed by four to five rows of short gouge marks below which is a band of triangles filled with opposed parallel-line hachure. In the fragment, *f*, alternate triangles of the lower band are filled by short gouge marks continued from above. On *g* the triangles are large, and are roughly filled with opposed parallel scorings. The incising should perhaps be termed "gouging," as some of the paste has actually been removed with a semicircular gouge-like tool of bone or reed. Smoothing with a polishing pebble has not

crushed in or burred the edges of the gouged troughs (cf. sherd *g* where scoring has forced a surplus of material to the sides, leaving ridges). The lower halves of these ollas from the shoulders down are plain.

Plain Brown Bowls (Plate 90, *a* and *b*; miniatures, Plate 89 *j-m*): 28 collected; majority, 5 to 6 inches in diameter; extremes in diameter $\frac{3}{4}$ of an inch to 8 inches; larger bowls built by coiling; small thick-walled bowls shaped from a lump of clay; walls $\frac{1}{8}$ to $\frac{1}{16}$ of an inch thick; rim with round edge of the same thickness as body.

The vessels were smoothed with the fingers, or rubbed with a stone to form a rough to medium-smooth surface; the paste is friable with fine and medium-coarse sand tempering, and no slip. They are shallow to hemispherical in form, some with a slight incurve of wall at the top.

Plain Brown Seed Bowls (Plate 90, *e*): 4 complete, 1 fragmentary; 3 to 5 $\frac{1}{2}$ inches in diameter; wide orifice; presumably built by coiling; walls $\frac{1}{8}$ to $\frac{1}{4}$ of an inch thick; edge of rim rounded.

There is a moderate amount of polishing on the outside with insides smoothed with fingers. They have no slip. Their general shape is the same as that of the black-on-white decorated seed bowls.

Red and Brown Ware Pots with Hooks at Rim: only 2 small vessels of this type in collection; height of specimen at Plate 90, *g* (outline on Plate 80, *l*) 4 inches, greatest diameter 5 $\frac{1}{2}$ inches; $\frac{1}{2}$ -inch walls; interior smoothed and rubbed with stone; exterior striated; height of specimen *k*, Plate 80, 4 $\frac{1}{2}$ inches, greatest diameter 5 inches; $\frac{3}{16}$ -inch walls; roughly finished inside and on outer base; shoulder and breast crudely decorated with stick punch marks.

Plain Brown Jugs (Plate 91, *g* and *k*, and Plate 80, *g-j*): 18 in collection; 1 $\frac{3}{4}$ to 7 inches in diameter, 2 to 6 inches high (diameter and height nearly the same); $\frac{1}{2}$ -inch to 4 $\frac{1}{2}$ inch diameter of orifice (orifice slightly over $\frac{1}{2}$ the diameter); constructed by coiling; walls $\frac{1}{8}$ to $\frac{1}{4}$ of an inch thick; rim sometimes thinned, with rounded edge.

The exteriors have been well or indifferently polished, occasionally striated with the insides smooth. The paste is fine to medium-coarse. These jugs are generally globular in form with straight and outcurved rims and rounded bottoms. Occasionally they are decorated with rows of stick marks on the breast or with knobs on the shoulder. Types of handles are seen on Plate 97. No black-on-

white jugs have been found at Swarts or observed elsewhere in the Mimbres area.

Plain Brown Ollas (Plate 92, *a-b*; miniatures, Plate 89, *b-d*): 11 in collection; $1\frac{1}{2}$ to $8\frac{1}{2}$ inches in diameter, $1\frac{1}{2}$ to $7\frac{1}{2}$ inches high (diameter and height approximately the same); $\frac{3}{4}$ -inch to 4-inch orifice (orifice about $\frac{1}{2}$ the diameter); with exception of miniature vessels, made by coiling; walls average $\frac{1}{2}$ of an inch thick; rim edge rounded.

The outer surfaces have been stone rubbed or left rough and striated, and the paste is friable with fine to medium-coarse tempering. The bottoms and sides are round, the necks short, and rims outcurved. As a variation of this form, one or two specimens have their greatest body diameters near the bases, thus producing longer necks.

Spiral Rub Bowls (Plate 90, *k-k'*): 3 found; 8 inches, $8\frac{1}{2}$, and $10\frac{1}{2}$ inches in diameter; fine coiling technique; unthickened round rim edge; wall $\frac{1}{2}$ of an inch thick.

The bowls show a medium-smooth polish inside and out, with medium-coarse tempering. The paste contains iron oxide, having fired to a red-brown. One bowl was washed on the inside with dark red oxide which is smeared over the edge on the outside. The shapes are hemispherical or slightly under. The outsides of 2 bowls appear to have been deeply scored with marks which radiate from the centers of the bases and swing to the right and toward the rims in sweeping curves. After this treatment the roughened surfaces were smoothed with a stone, which followed the scorings, producing the effect of spiral corrugations. The outside of the largest bowl of this type in the collection has a smoothed corrugated surface, but the same spiral effect is produced by indentations made by the rubbing pebble, as in the rubbed scored bowls. In each type the surface below the rim has been smoothed, leaving a plain band above the rubbed scorings.

Spiral Rub Seed Bowls (Plate 90, *f*): 2 in collection; $5\frac{1}{2}$ and 6 inches in diameter; wide orifice; presumably built by coiling; walls $\frac{3}{8}$ to $\frac{1}{2}$ of an inch thick; round edged rim.

These have been smoothed on the outsides with a stone, and on the insides with fingers, with some work of a polishing stone showing. They are made of a typical Mimbres paste with no slip. The bowls either have been tinted with a thin reddish wash of iron oxide or are composed of a paste containing yellow iron oxide that fired

red and produced a similar effect. The shapes are the same as those of the black-on-white seed bowls, and the decorative effect of seemingly spiral corrugations on the outsides is the same as that produced on the spiral rub bowls.

Corrugated Wares. Various surface treatments are illustrated by Plates 93 and 94.

Corrugated bowls (Plate 90, *h*): only 2 found; diameters $7\frac{1}{2}$ and $9\frac{1}{2}$ inches; coarse rubbed coiling; walls $\frac{1}{16}$ to $\frac{1}{4}$ of an inch thick; edge of rim rounded, not heavier than walls.

The insides of the bowls were smoothed and outer corrugations rubbed with stone. One bowl has slightly flattened bottom and straight flaring sides, and the other is round-bottomed. There is no decorative effect other than the unobliterated corrugations on the outside, and a band of two or three rows of smoothed corrugations at the top.

Corrugated-neck Jugs (Plate 80 and Plate 91, *a-f*): 26 found; $2\frac{1}{2}$ to 8 inches in diameter, $2\frac{1}{2}$ to 8 inches in height (diameter and height approximately the same); orifice $1\frac{1}{2}$ to $3\frac{1}{2}$ inches (orifice about $\frac{1}{2}$ the diameter); constructed by coiling; walls $\frac{3}{16}$ to $\frac{1}{4}$ of an inch thick; rim sometimes thinned; edge of rim rounded.

There is a medium-smooth polish on the bodies while the insides are smooth. The paste is medium-coarse. The jugs are full-bodied, with round bottoms and outcurved rims. One or more rows of corrugations below the rims are obliterated to form a smooth band. There are either sharp, pinched, or smoothed corrugations on the neck of a jug, with punch marks at the juncture of these corrugations and the plain body. There are also corrugated bands set a short distance below the rim or covering the neck and breast. One complete jug (Plate 91, *c*) and some fragments, have the appearance of a corrugated neck set inside the rim of a bowl (rare). One specimen has lobes around the shoulder while 2 others have decorative rows of finger-nail marks on the bodies. Handle types are shown on Plates 97-99.

Corrugated-neck Ollas (Plates 80 and 92): 16 complete and fragmentary specimens; 6 to 17 inches in diameter; $6\frac{1}{2}$ to 18 inches in height (diameter and height nearly the same); $3\frac{1}{2}$ to 10-inch orifice (orifice approximately $\frac{1}{2}$ the diameter); walls $\frac{1}{4}$ to $\frac{3}{16}$ of an inch thick, maintaining a uniform thickness from the bottom to the rounded edge of the rim.

The interiors and exteriors of the ollas, below the corrugations, were well smoothed with a stone. The lower half of this type of vessel was built up with large ropes of clay which were smoothed out as far as the shoulder; from this point upward the overlapping clay strands were made small to form fine corrugations on breast and neck, which were either left sharp or slightly smoothed, with an occasional instance showing scraping or shaving off of the ridges. The paste is not very compact and contains rather coarse sand tempering. The vessels are usually wide through the center; some with large orifices are relatively tall and slender. The rims have a slight to pronounced outcurve, and the bases are commonly round, with an occasional tendency to taper, as in the black-on-white ollas. For decorative effect, bands of corrugations have been left on the neck below a smoothed rim, or cover the whole breast to the shoulder. The corrugations run from fine to coarse; they are sometimes sharp-edged, sometimes laid flat or slightly rubbed with a stone. Deep indentations, waved arrangements, and combinations of indented and plain corrugations have been used for diversity. The last course of corrugations was commonly treated with punch marks to emphasize the junction between the corrugated upper body and the plain lower surface (Plates 92 and 93). The marks vary considerably from vessel to vessel, but in any given case they are the same.

All-over-corrugated Jugs (Plate 80 and Plate 91, *m-p*): 9 specimens; $3\frac{1}{4}$ to $6\frac{1}{4}$ inches in diameter; $1\frac{1}{4}$ to $5\frac{1}{4}$ inches in height (height slightly less than diameter); 2 to $3\frac{1}{2}$ -inch orifice; coiled from the bottom, corrugations rubbed or left sharp; walls $\frac{1}{8}$ to $\frac{1}{4}$ of an inch in thickness; rim slightly thinned with smoothed band below the outer edge; edge rounded.

The insides are both smooth and stone-rubbed, and the paste is friable and medium-coarse. The rims are either straight or out-curved. Occasional stick marks or scorings are found on corrugated surfaces for decoration. Handle types of these jugs are shown on Plates 97-99.

All-over-corrugated Ollas (Plate 92, *k*): 2 specimens; $3\frac{1}{4}$ and 7 inches in diameter; $2\frac{1}{4}$ and 7 inches in height (diameter and height the same, or nearly so); 2 and $4\frac{1}{4}$ -inch orifice; coiled from center of base, corrugations left sharp; walls $\frac{1}{4}$ of an inch thick; rim

thinned and slightly outcurved, with edge rounded; bottom of vessel rounded.

The insides have been polished with a stone and the paste is medium-coarse. The unusually wide orifice produces a sort of pot shape.

Ceremonial Bowls (Plate 88). The small, plain brown cups and bowls, *a-f*, all with perforations for suspension by thongs, and a larger decorated oval bowl, *g*, with indented ends similar to *f*, are so unusual in form that they suggest a use comparable to the terraced-edge altar-bowls of the Hopi. The bowl *h*, with spurs on the outside, is freakish, and may have served a like purpose. These bowls were included in the count of plain brown and decorated vessels.

Ladles (Plate 96). There are 11 in collection; 3 of them, *a-c*, are trade pieces. Of these ladles, 7 are crude and undecorated; among them *e*, *f*, and *k* are of the bowl-and-handle type, with round handle at or slightly below the rim; 3 others, like *g* and *h*, have a more flattened handle attached to the bowl-rim; the seventh, *d*, has a heavy concave handle approaching the split-gourd shape of the painted fragment, *j*. The paste of *d-k* is Mimbres, while that of the 3 intrusive black-on-white split-gourd type handles, *a-c*, is characteristic of the Upper Gila wares or possibly of pottery from still farther north.

On Plate 83 are shown 2 pieces of pottery: *b*, with an adult burial below the floor of the Late Room 96; *c*, a decorated half-gourd-shaped bowl, found outside the buildings, which contained a child's body. The former, with intentionally contracted sides, is dipper-shaped, but is not as much of a ladle as *c*, which is somewhat like a possible outline restoration from the handle *j*, Plate 96. These bowls and *j* resemble the dipper-shaped ladles from the Middle Gila, described by Kidder,¹ while the solid-handled undecorated ladles are not unlike those from the Little Colorado drainage. Ladles are extremely scarce in the Mimbres area.

Handles. *Plain Vertical Handles* (Plate 97). These are made of one to four parallel rolls of clay, with the upper attachment usually at rim, and the lower on the breast of the vessel. Single and double roll handles are, as a rule, confined to plain-bodied jugs, while multi-

¹ Kidder, 1924, *An Introduction to the Study of Southwestern Archaeology*, p. 109.

ple roll handles are attached to more elaborate jugs with corrugated necks. The 2 flattened handles, *e* and *f*, the only painted ones found, are polished, but the others show little smoothing other than that given with the fingers.

Twisted and Braided Vertical Handles (Plate 98). With 3 exceptions, all the examples in the collection are found on small corrugated jugs, or jugs with corrugated necks and plain bodies. They are made of loose or tight twists of two strands of clay, used singly or in two to four parallel rows. By reversing the twists and placing them beside each other, a braided effect is produced; the true braided handle, *a*, is unusual. Two twists separated by a bar, and single or double twists outlined on the sides by smooth rolls of clay, make attractive handles.

Horizontal Handles. These handles, of smooth or twisted rolls of clay, are placed on opposite sides of the breasts, at varying distances below the rims of pot-shaped vessels with rounded sides and slightly incurved rims. At times they are found on the small, wide-mouthed, corrugated-neck ollas. They are similar to the vertical handles, differing only in that they form a smaller loop.

Life Forms in Handles (Plate 99). Handles with projections or small knobs at the tops suggest life forms and resemble those found on pottery from the Tularosa country of western New Mexico. The handle *g* shows the protruding eyes and the bump at the end of the spine, noticeable on young frogs; *j* is a lug which seems to represent the hind quarters of a short-legged animal. Handles of this type are attached to jug-shaped vessels.

Lugs on Pottery (Plate 100). These occur, for the most part, on opposite sides of small ollas, and less commonly on small bowls. In the case of ollas they are about equally divided between plain and decorated vessels, on which they are found near the rims or lower down on the breasts. Before the clay dried lugs were pierced vertically or horizontally with a stick to facilitate suspension of the vessel by a thong; the vertically pierced lugs, *h* and *j*, were provided with a groove to hold the thong in place so that the vessel would hang properly. At *k-m* are seen fragments of small crude bowls with pierced ears and lugs at rim (cf. *d* and *e*, Plate 88). The decorative design on the body of the vessel is sometimes carried across the lugs, as on *b* and *d*; the lug *e* received special embellish-

ment; lugs on open panels or on decorated bands were often left plain.

Unpierced Lugs, Flanges, and Hooks (Plate 101). Such handles are commonly found on the small, corrugated and plain pots and jars. They are usually placed on the rim at opposite sides or at varying distances between it and the lower edge of the breast. The development of the flange as it becomes narrow and is bent over to form a hook can be followed through the series, *a-f*, where the elongated hook has become a half-loop handle, allowing the vessel to be lifted with one hand. The low set flange, *k*, one of a pair on an oddly shaped vessel, is unusual.

Attachment of Handles. The method of attaching handles to prehistoric pottery vessels at Swarts was the same as that practiced by the modern Pueblos.¹ At times, lugs and small handles were fastened by welding to the rim and side. In most cases, however, a stronger attachment was obtained by punching a hole in the side of the pot and inserting the end of the handle, which was then smoothed over or riveted on the inside of the jar. This obliterated all traces of the process, which is disclosed only when the piece has been broken. At *a*, Plate 102, is shown the side of a vessel from which a handle has become detached; *b* and *c* are a lug and plain handle; all show the method of riveting. The wide and elaborate handles of plain and twisted strands would seem to have required attachment to the body of the jug by the welding process. It was discovered, however, that in these cases a hole large enough to accommodate the wide handle was cut in the side of the jar, and the lower end was inserted and riveted on the inside; the upper end was attached by welding to the rim.

Clay Pipes (Plate 103): 6 perfect, 26 fragments; about $\frac{3}{4}$ of the specimens conical; variants more barrel-shaped with rim slightly incurved; $1\frac{1}{2}$ to $2\frac{1}{2}$ inches in length, 1 to $2\frac{1}{2}$ inches in diameter at bell of conical pipes or at center of those of barrel form; $\frac{3}{16}$ -inch to $\frac{1}{4}$ -inch stem-holes punched in base before clay was dry.

The sides and interior are rough. None are painted, and only 2, *d* and *f*, are crudely decorated with stick and finger-nail marks. Pipes *a* and *b* resemble Basket-maker III clay pipes found by Kiddler and Guernsey in Cave 1, Marsh Pass.²

¹ Guthe, 1925, *Pueblo Pottery Making*, Plate 17, b, p. 50.

² Kiddler and Guernsey, 1919, *Archaeological Explorations in Northeastern Arizona*, Figure 94, d, pp. 187 and 188.

These and the cone-shaped pipes seem to be contemporaneous at Swarts, as both types were found in room fills, on or slightly below floors. None came from Early pit-houses. Clay pipes have been taken from other ruins in the Mimbres district. (For stone pipes, see Plate 55.)

Pottery Objects (Plate 104). These articles are made from sherds and of shaped and fired clay. The disc, *b*, cut from a sherd, is among hundreds found throughout the ruin; they vary from $\frac{5}{16}$ of an inch to $3\frac{1}{2}$ inches in diameter and seem to have been gaming chips. Numerous drilled pottery discs, similar to *c*, and 1 to 3 inches in diameter, probably served as spindle whorls. The clay specimens, *a*, *d*, and *k* are molded and fired. Their use is problematical; *k* suggests the seed pod of the flowering yucca.

Potter's Tools (Plate 102). A great many potter's tools made of sherds were found throughout the excavations. The oval and oblong forms ($1\frac{1}{2}$ to $6\frac{1}{2}$ inches in length) were the most popular. Sherds were ground into numbers of convenient shapes to conform as nearly as possible to the curvature of vessels in manufacture. Pieces of olla rims also made convenient tools. Originally the edges of the tools were probably squared, and later became rounded from use; *e* and *f* have either been intentionally beveled on the concave side to be used as scrapers, or have been worn in this way through being rubbed on the outer surfaces of vessels; *g* is beveled on the convex side as a result of being used to smooth the insides of bowls; and the edge of *m* is apparently worn uneven through use in smoothing bowl rims. No fragments of potter's tools made from gourds remained in the soil, although it is possible that they were utilized as they are today. Some animal ribs, Plate 68, may have been pottery scrapers.

Pottery-polishing stones, *h-k*, were abundant; they are irregular in form and of fine grained waterworn pebbles or iron concretions. The stones are in no way standardized. Their worn and glossy surfaces indicate long use.

Potter's tools were found in rooms as well as in the refuse below them. Implements manufactured from pieces of broken vessels and the stone polishers are common in all Mimbres ruins.

Inception of Mimbres Pottery. Although successive steps in house construction have been shown, the ceramics of Swarts give only faint hints of the possible beginning of Mimbres pottery mak-

ing in a small amount of the plain red-washed wares and in the undecorated so-called ceremonial pottery which, as shown by sherds, appear more profusely in the Early and Middle Periods of the occupation of this place. Bradfield found by trenching a dump at his Cameron Creek site (a Mimbres village) that the plain ware and red-washed pottery were the first to be made, the former containing the Bradfield "Early Red" and the latter his "Early Gray" type paste, although possibly later than the red wash ware.¹

Mimbres Designs. The Frontispiece and Plates 108-232 illustrate the decoration of all reasonably complete vessels recovered at Swarts, as well as 45 which came to light from a nearby village, similar in all respects to those of Swarts.² Since there is such a diversified arrangement of the comparatively few standard decorative elements to be found on this pottery, it is difficult at times satisfactorily to segregate into independent and easily recognized groups even the simpler Mimbres Bold-face designs, to say nothing of the more complicated designs of the Mimbres Classic. The material was grouped on the basis of salient features in order to illustrate as nearly as possible the adaptation and combination of certain units without regard to others that would seem at first glance to place the lot in a different category. This arrangement may necessarily be changed at some future time when it is possible to enter into a detailed analysis of the decoration given this outstanding ware.

In reproducing these decorations, most of which are on the interiors of bowls, all have been reduced to uniform size, the catalogue numbers and dimensions of the vessels being on record at this Museum. Where it was clearly evident how the design followed through on a fragmentary specimen, or one that was broken in the killing or sacrificing of the bowl, the drawing was completed; otherwise it was left blank.

In the 741 pieces illustrated, and in a number of specimens too fragmentary to be reproduced, no repetitions in decoration were found. The nearest duplications are shown on Plate 191. As an example of the steadiness of hand and accuracy of brush work possessed by these artists, the border around the bowl *f*, Plate 208, is cited. In this case, as a part of the multiple line border, 15 accu-

¹ Bradfield, 1931, *Cameron Creek Village*, pp. 44-45.

² The plate numbers of these vessels are to be found on page 90.

rately spaced parallel hair lines were used to make up a ribbon $\frac{1}{8}$ of an inch wide.

In the grouping of the pottery designs, the decorations of flare rimmed bowls, seed bowls, and ollas became distributed through the series with those found on the interiors of the standard Mimbres open bowls. To avoid confusion, and to enable segregation of the illustrations showing the decoration on these vessels, the following plate numbers are given:

Flare Rimmed Bowl Designs: Plates 112, c; 123, e and f; 124, e; 126, d; 129, c and f; 130, b, c, and f; 131, c and d; 132, b, d, and f; 133, b; 136, f; 139, b; 142, c; 149, d; 152, d; 153, d; 156, f; 157, f; 164, d; 171, c; 173, b; 175, a and d; 176, a, b, c, d, and f; 177, a, b, and c; 178, d and e; 185, e; 190, c and d; 192, d; 203, e; 209, e; 213, b; 230, d; 231, b.

Seed Bowl Designs: Plates 130, e; 131, e; 148, a; 151, a; 171, f; 175, b and e; 188, b and c.

Olla Designs: Plates 129, b; 131, a; 133, c; 137, e; 143, a; 144, c; 147, b; 183, b.

The following plate numbers denote the 45 pieces of pottery taken from a nearby Mimbres ruin: 124, c; 126, e; 127, d; 129, b and c; 132, f; 133, c; 136, c and e; 141, d; 144, c; 146, f; 149, b; 151, b; 158, d; 160, b and c; 161, b and d; 164, b; 169, a; 176, e; 177, a; 181, f; 184, f; 187, f; 190, c; 192, d and e; 197, d; 206, b and d; 208, e; 209, f; 210, a; 212, c; 214, d; 216, e; 217, b; 220, b; 221, d; 222, a; 224, b; 228, b; 231, f.

DESIGN GROUPING

MIMBRES BOLD-FACE BLACK-ON-WHITE

<i>Design</i>	<i>Plate</i>
Broad waved lines and waved hachure	108
Coarse and waved hachure fills and interlocking scrolls appendant to triangular figures	109, a - 113, a
Double flags or stalked triangles with picot edge and the character- istic coarse straight hachure	113, b - 114, f
Wide and coarse line and nearly solid triangular figures suspended from the rim	115, a - 117, b
Concentric and cribbed rectangular figures	117, c - 117, f
Miscellaneous	118
Cactus (?) figures	119, a - c
Crude naturalistic figures of birds, animals, and reptiles	119, d - 120, f

MIMBRES CLASSIC BLACK-ON-WHITE

<i>Design</i>	<i>Plate</i>
Parallel line ribbon decoration	121
Cribbed ribbons composed of uniform fine parallel lines	122, a - 125, a
Multiple parallel line decoration, occasionally embellished	125, b - 126, c
Multiple parallel line borders with designs in center of field	126, d - 127, b
General effect of a star	127, c - 130, d
The pinwheel, a striking design often produced by negative parallelograms formed between the opposed solid or hatched triangular figures encircling the bowl	130, e - 132, a
Checkerwork	132, b - 133, f
Key figures suspended from the border or radiating from the center	134, a - 136, f
Stalked keys, commonly opposed in hatched and solid figures	137, a - 139, b
Deeply dentate keys or wings, either attached to the rim border or radiating from the center	139, c - 143, f
Ribbons of narrow and wide lines sometimes separating dentate figures, which causes the ribbon to follow a zigzag course and makes this part of the decoration outstanding	144, a - 145, e
The crook used independently; as an extension or as a branch of a ribbon design; as an appendage to rectangular figures; and also used independently in pairs to form an S-shaped figure	145, f - 146, f
Interlocking scrolls as a graceful appendage to triangular figures incorporated in the general decoration	147, a - 152, f
Cavettos (an architectural term used for convenience) attached to an encircling decorative band are prevalent in Mimbres pottery decoration. The use of this figure in combination with others leaves undecorated surfaces suggesting flowers or peculiar propeller blade forms	153, a - 156, b
Double cavetto, a combination of two cavettos which, when placed around the border, produces an effect of negative blossoms with obovate petals. In the arrangement of the plates the cavetto and double cavetto become flattened at the end of the series	156, c - 158, f
Square centers. In this group of designs an outstanding feature is the departure from open circular centers to a square which is usually left blank but occasionally is filled. By extending the side lines of the rectangle the field is quartered, giving the general effect of a simple swastika, which may become more elaborate by the addition of other figures	159, a - 162, b
Interlocking figures at center, composed of frets or opposed keys	162, c - 163, c
All-over decoration	163, d - 163, e
Irregular open centers with decoration divisible into halves, quarters, and thirds	163, f - 168, a
Circular open centers around which are wide or narrow decorative bands divisible into halves or multiples of halves	168, f - 183, c
Circular open centers around which are wide or narrow decorative bands divisible into thirds or multiples of thirds	183, d - 190, f

<i>Design</i>	<i>Plate</i>
Nearest duplicates in decoration found at Swarts	191
Complete designs in polychrome	192
Polychrome designs on sherds	193
Human or animal tracks with crude geometric design (a); feather design (b); shell bracelets (c)	194, a - c
Life forms in negative	194, d - 196, b
Crawling and flying insects	196, c - 199, f
Lizards and horned toads. It is interesting to note that nearly all the drawings show the characteristic five toes. One drawing (201, c) depicts a lizard as having lost its easily disjointed tail	200, a - 201, e
Frogs	201, f - 202, e
Turtles	202, d - 204, d
Fish	204, e - 208, e
Hérons	208, f - 209, f
Duck	210, a
Bird forms, conventionalized and elaborately drawn	210, b - 214, f
Quail	215, a - 215, d
Buzzards and turkeys	215, e - 216, d
Opossum	216, e
Rabbits	216, f - 218, a
Carnivorous animals appearing to represent the badger, coyote, and species of the cat family	218, b - 219, e
Mountain sheep	219, f - 221, f
Does and fawns	222, a - 223, a
Male deer	223, b
Prong horn antelopes	223, c - 225, a
Events or experiences in the life of the people	225, b - 225, f
The Mimbres man with and without masks	226
Human figures	227, a - 227, e
Dance figures	227, d - 227, f
Ceremonial objects and events; also what appears to be the picturing of mythological tales	228, a - 232, b
Sherds depicting macaw heads, a snare, and other subjects	232, c - 232, l

Trade Wares. From the north are 2 sherds of Pueblo I and fragments of 3 early Pueblo II vessels; black-on-white sherds from the Little Colorado, also sherds and a complete bowl of St. Johns polychrome; and sherds and bowls of black-on-white and corrugated Tularosa wares.¹ From the south there are 2 sherds of Proto Casa Grandes, Chihuahua. From the east are a bowl, an olla, and sherds of El Paso polychrome; also sherds and bowls of wide and narrow-line Three Rivers red-on-terracotta, a ware at present sus-

¹ The term *Tulaecan* is applied to the wares of the San Francisco-Tularosa drainage, and does not include the headwaters of the Gila River.

pected of having originated in the Alamogordo district north of El Paso, Texas. Olla sherds and a bowl of Chupadero black-on-white also represent trade pieces from the east and farther north. Four unusual intrusive sherds were found at Swarts, bearing marks of three sizes of string. In the survey of 1930, sherds with cord impressions were found at a ruin east of Deming, New Mexico, and also at six sites in the extreme southwestern part of the state. So few instances of this technique appear in collections from the Southwest that it is thought important to record these finds. The ruins from which they emanate are either predominantly Middle Gila, Chihuahua polychrome, or a mixture of both. No sherds showing the impressions of basketry came to light either at Swarts or elsewhere in the region.

Of trade wares, the black-on-white pottery of Pueblo I, the Little Colorado black-on-white and black-on-red, Tularosa black-on-white, and Chihuahua polychrome are well known from the works of Fewkes, Hough, Kidder, F. H. H. Roberts, Jr., and Gladwin. Certain other trade wares found at Swarts have not, however, been described and illustrated so fully. These are considered in the following paragraphs.

*El Paso Polychrome*¹ (Plate 105). Numbers of sherds, a plain pot, and a decorated pot, *a* (both being deep with constricted openings), and a decorated olla, *d*, were found at the Swarts Ruin. These specimens, together with some sherds from other places, a decorated bowl, *c*, from Newman, New Mexico, in the R. B. Alves collection, half a decorated olla, *b*, from a ruin north of Las Cruces, New Mexico, and a specimen in the Peabody Museum from Casas Grandes, Chihuahua (not illustrated), are all that are at present available to use in studying this ware. The piece from Casas Grandes is made of two small ollas whose sides are connected by a hollow bar and whose rims are joined by a solid curved handle. It presumably found its way into Mexico from the north.

The vessels were built by coiling; the walls are $\frac{3}{8}$ of an inch thick with only an occasional increase to $\frac{1}{2}$ or $\frac{3}{4}$ of an inch. The edges of the rims are commonly flattened, but in some ollas with outcurved rims, they are round. The surfaces are fairly well

¹ Named by Elleen E. Alves (*Pottery of the El Paso Region*, Bulletin of the Texas Archaeological and Paleontological Society, Vol. III, p. 57, Abilene, Texas, 1931) and described by W. S. Stallings, Jr. (*El Paso Polychrome*, Technical Series, Bulletin No. 3, Archaeological Survey, Laboratory of Anthropology, Incorporated, Santa Fe, New Mexico, December, 1931).

smoothed, showing the striations of a polishing pebble horizontally on the insides and vertically on the outsides. The paste is coarse and friable, firing black, and distinctively marked by large corn-meal-like specks of crystalline quartz.

The forms, as known at this time, are small, deep pots with a slight contraction at the top, round-bottomed bowls of medium depth, full-bodied, round-bottomed ollas with outcurved rims or with straight necks, and ollas of more slender appearance with less pronouncedly outcurved rims and orifices large in proportion to the girth. Open half-gourd-shaped ladles occur in very limited numbers. In both ollas and bowls, the quick taper from fairly thick rims to very thin walls is particularly noticeable.

The pigments used on this ware are an iron oxide that fires from a dark red to a rich maroon, and a carbonized vegetal substance that, when heavily applied, produces a good black. The hydrofluoric acid test proves the black paint to be of Miss Hawley's Type 2, carbon protected by a light film of silicate.¹ On this pottery the film protecting the carbon is so thin that in order to get the best results, the acid must be weakened or rinsed off immediately before the sherd is heated. The following chemical test, made by Mr. F. A. Gonyer of the Department of Mineralogy of Harvard University shows the red pigment to be an iron oxide paint, containing no oxide of manganese:

Place three or four drops of a mixture of HF (hydrofluoric acid) and HCl (hydrochloric acid) on the sherd; allow to stand for a minute or so in the cold. Rinse off with water, and to this solution add a drop or two of $K_4[Fe(CN)_6]$ (potassium ferrocyanide). An intense blue precipitate indicates the presence of ferric oxide.

A cursory examination of this pottery gives the impression that it is decorated with black on a red background. In some instances it actually is, but a closer examination discloses the fact that there are three methods of handling the red and black paints. In the first, a red wash was applied to the outside of an olla or the inner surface of a bowl, and carried onto the edge of the rim. Over this the black design was painted, with occasional secondary red fillings to brighten the decoration or to true up the black lines. In the second method, the black alone was laid on the smooth brown paste. In the third, also, there is no red wash, the black and red being ap-

¹ Hawley, 1929, *Pigments in the Southwest*, p. 733.

plied directly to the paste, the red again serving to true up the black lines. Characteristics of decoration are: edge of rim in a bowl or an olla painted red, regardless of whether the vessel is slipped with red or not; a wide black band below the rim on the inside of an olla neck; coarse wide black lines showing careless brush work. Designs, as far as can be ascertained from the few available specimens, seem to consist of fairly regular opposed key figures in a framed band, or of key figures greatly reduced and distorted and separated by stepped figures (Plate 105, *d* and *d'*). The unusual narrow-line decoration, *a'*, below the rim of the pot *a*, is in sharp contrast to the heavy designs on other specimens.

According to data secured during the various reconnaissance trips made by the authors, the center of distribution of this ware lies in the territory between Alamogordo, New Mexico, and El Paso, Texas. At sites in that region the sherds were found in great quantities and were always at least twice as common as fragments of black-on-white and corrugated wares. This same pottery was also found in the Rio Grande Valley at El Paso and was traced up the river to a point thirty-five miles north of Las Cruces, New Mexico. In diminishing quantity it was seen along the international border as far west as the Arizona line in southwestern New Mexico. Sauer and Brand mention a "crude black-on-brown ware" found at three ruins in the Chiricahua mountains of southeastern Arizona which, from their description, suggests El Paso polychrome.¹

Chupadero Black-on-white. The name Chupadero black-on-white has been suggested for this ware by Dr. Harry P. Mera of the Laboratory of Anthropology in Santa Fe, New Mexico. The designs of 6 bowls are shown on Plate 106. The bowl *a* and some sherds found at Swarts made their way by trade in late times to the Mimbres Valley; *b* was found at Davis Dome, twenty miles north of Newman, New Mexico, and is now in the collection of Mr. and Mrs. R. B. Alves of El Paso, Texas, who generously allow us to illustrate the specimen; *c* is a restoration from a fragment of a bowl found near La Luz, New Mexico, kindly donated to the Peabody Museum by Mr. Edgar B. Howard of Bryn Mawr, Pennsylvania; *d*, *e*, and *f* on the same plate, and the olla *a* (Plate 107) were found at Three Rivers, New Mexico, during excavations made by the authors for

¹ Sauer and Brand, 1930, *Pueblo Sites in Southeastern Arizona*, Figure 2, p. 422.

the El Paso Archaeological Society, which now possesses the specimens. The olla *b* (Plate 107), also owned by Mr. and Mrs. Alves, came from a ranch fifteen miles west of Sabin, Chihuahua, a station on the Mexico Northwestern Railroad.

With such a small number of complete specimens of bowls, the range of sizes may be misleading, yet in this lot the extremes seem to be represented and the average size will no doubt be determined when more pieces have been found.

The small bowls *b*, *d*, *e*, and *f* (Plate 106) vary from $4\frac{1}{2}$ to $5\frac{1}{2}$ inches in diameter, and from $1\frac{3}{4}$ to $2\frac{3}{4}$ inches in depth. The larger bowls, *a* and *c*, are $11\frac{1}{2}$ and $13\frac{1}{2}$ inches in diameter, and $3\frac{3}{4}$ and 6 inches deep respectively.

The bowls were constructed by the coiling process, with the bottoms flattened by seating, while still soft, on a smooth surface. In thinning the walls of a bowl, the bottom was left in its original thickness, and a raised disc was thus formed for a base, which keeps the bowl from rocking (Plate 107, *c'* and *d'*). Walls are $\frac{3}{16}$ to $\frac{1}{4}$ of an inch in thickness and the rim edges are rather flat. The outsides are rough and conspicuously striated. It appears from examination of *c'*, the outside of bowl *c* from La Luz, that these marks are the result of smoothing the outer surface and thinning the walls with a bunch of coarse grass; on the bowl *d'*, the reverse of *d*, from Swarts, stiff grass blades seem to have been bound into a brush, causing deeper striations. On the inside the same method of thinning was used, but the striations were partly erased and a fairly smooth but by no means a polished surface was produced with a potter's tool or stone, and perhaps finished by rubbing with the fingers. The paste is medium hard, light gray in color throughout, and contains fine to medium-coarse milky quartz sand tempering. The slip, applied to the interior after the above mentioned thinning and smoothing, is grayish-white and not heavy enough to conceal completely the granular surface below. One bowl shows a slight polishing of the slip with a stone. The black paint is rather thin, and at times does not cover well. These characteristics can be seen in *a-d*, Plate 107. Another characteristic, not so well brought out in the illustration, is a tendency for both slip and paint to have a finely cracked appearance. Chemical tests show the paint to be the carbon and iron Hawley Type 3 mixture,¹ which when unevenly fired, changes to

¹ Hawley, 1929, *Pigments in the Southwest*, p. 736.

various shades of brown on the same vessel. In form the bowls cannot be said to be segments of spheres as their walls usually have an outward pitch.

The olla *a* (Plate 107) was also built by coiling; the base was slightly flattened. In diameter it is $10\frac{1}{2}$ inches, in height $10\frac{1}{4}$ inches, with an orifice of $2\frac{1}{2}$ inches. A full round body, a small orifice, and neck with an outward curve give this vessel the form of a large, handled bottle. The rim edge is rounded and painted black. The double plain roll handle, attached just below the rim, is fastened to the body above the center of the breast. The diameter of the olla *b*, in the Alves collection, is $7\frac{1}{2}$ inches, height $7\frac{1}{2}$ inches, and orifice $1\frac{1}{2}$ inches. In type of handle and outline of body, this piece almost duplicates *a*, the only variation being in the longer neck.

Vessels were slipped, and in applying the paint to the inside of a bowl, the white coating was not allowed to run over the rim on the outside, as it often did on Mimbres ware; rims were painted. The inner surfaces were divided into thirds or quarters, and the wide bands and the coarse, heavy parallel-hatched figures, with framing lines of the same weight, produced a bold decoration. Another outstanding feature of the decoration seems to be the use of large, solid dentate figures, whose points touch those of similar hatched figures opposed to them. One of these figures is used in each of the triangular spaces on the bowls figured at *a* and *f*, Plate 106, and two of them fill each section of the band encircling the bowl *c*. On the olla *a* (Plate 107) the same fill is seen in the more uniform panels which form a wide, framed band that nearly covers the body, and which are equally spaced above and below the shoulder of the vessel. In this treatment, either the hatched or the black dentate figure is stalked, with the opposing figure touching it at the points. The opposing hatched figures on the bowls *c* and *f* have no attachment except at the points, while the corresponding figure in black on the bowl *a* touches the points and is suspended from the bowl rim. On the olla *a* (Plate 107) the central hatched figure is made up by doubling two such units and is supported by means of its points touching those of the solid dentate keys on either side. The framed band encircling the body of the olla *b* is composed of a wide black meander with fills of the typical dentate hatched figures. Another apparent earmark of this ware is a set of horizontal dashes or a framed band of large dots encircling the olla neck below the rim.

On the bowls *b*, *d*, and *e* (Plate 106) the dentate figures are replaced by other designs yet sufficient resemblance is seen in the heavy, wide line work, color of pigment, surface texture, and method of construction to permit confident identification of these vessels as Chupadero black-on-white.

The writers have traced this pottery south from Three Rivers, New Mexico, to El Paso, Texas, east from there nearly to the Guadalupe Mountains, and also up the Rio Grande Valley to Fort Selden above Las Cruces, New Mexico. In this section of the Rio Grande Valley and north toward Three Rivers, Chupadero pottery is abundant. It decreases toward the east and also to the west through the Mimbres country where it eventually fades out along the southern New Mexico-Arizona line.¹

Three Rivers Red-on-terracotta. This ware is represented in the collection by sherds and 2 bowls from Swarts, and by sherds from other districts. The vessels were made by the coiling process; walls are $\frac{1}{8}$ to $\frac{1}{2}$ of an inch thick, and the edges of the rims are rounded. Bowls are well stone-polished inside and out, some with striated exteriors; the exteriors of ollas are polished, the inner surfaces smoothed with the fingers. They are made of a medium-hard, fine paste coarsely specked with particles of quartz, which fires to a uniform terracotta throughout, occasionally with a black core. No slip was applied, since a finish suitable for decoration was secured by moistening the paste and repeatedly troweling it to bring the finer particles to the surface for the final polish with a pebble. The pigment, as shown by Mr. Gonyer's test (page 94) is oxide of iron which fires to maroon. Our two complete bowls are round-bottomed and are more shallow than Mimbres bowls. One bowl sherd shows a slight incurve at the rim. Olla sherds indicate a vertical neck; body shape unknown. The brush work is uneven; lines are both wide and narrow. The decoration is on the insides of bowls,

¹ Since the above description was written, and the southern and western extensions of Chupadero pottery recorded, Dr. Mera has issued his report (Bulletin 1, Laboratory of Anthropology, Santa Fe, New Mexico, 1931), naming, as the type of ruin for the ware, a site east of Socorro, New Mexico, on the Chupadero mesa. Here nothing but the Chupadero black-on-white was found, and from his clear description of the pottery and its distribution, it is safe to assume that the center of its development was in that district. Dr. Mera also informs us that since issuing the bulletin, he has extended its range on the east to near Santa Rosa, New Mexico, where he found a true Chupadero pueblo. He also says that it is known as far south as Villa Ahumada, Mexico. This fact, with the information furnished by Mrs. Alves in regard to the olla from Sabinal, gives a southern distribution into Mexico well toward Camá Grandes, Chihuahua.

and outsides of ollas. The edges of bowl rims are painted red, while the edges of olla neck sherds are not painted. There is a wide painted band directly below an olla rim. The interior decoration of bowl *a* (Fig. 17) shows a narrow parallel-line border, each line of which drops from the rim toward the center, quartering the bowl; on *b* a large meander of two wide parallel lines encircles the interior. The small number of whole specimens and large sherds precludes the listing of a complete series of the shapes or the decorative units of these vessels. Nesbitt illustrates a Three Rivers red-on-terra-

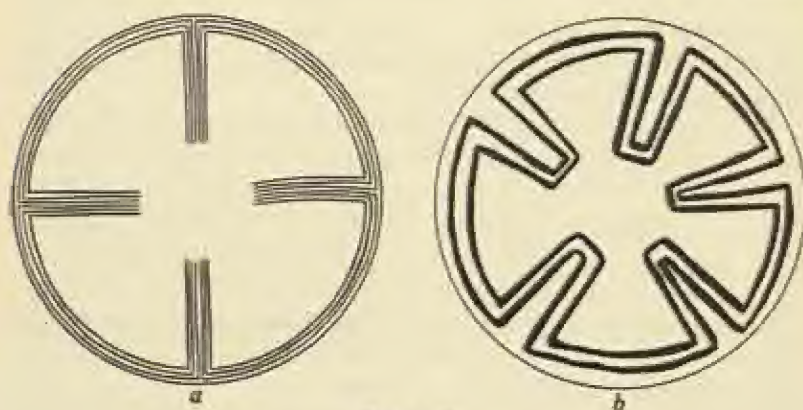


FIGURE 17

Three Rivers red-on-terra-cotta bowls found at Swarts.

cotta bowl, from another Mimbres ruin, that has an interlocking scroll incorporated in the narrow parallel-line decoration.¹ One sherd with interlocking scrolls was found at Swarts.

The home of this pottery is uncertain. Sherds are found in limited quantities west of the Mimbres to the Arizona-New Mexico line, south to the international border, and east to the White Sands country north of El Paso, Texas, where they are more plentiful. The ware was named "Three Rivers red-on-terra-cotta" because it constituted 25% of the sherds found at a ruin at Three Rivers, New Mexico, the remainder being principally black-on-white and corrugated.

¹ Nesbitt, 1931, *The Ancient Mimbres*, Plate 42, p. 97.

SKELETAL MATERIAL

General Description. The skeletal remains were in extremely bad condition, the result of being in the valley where drainage from the side hills, and periodical rises of the river subirrigated the soil in which the bodies lay. In the sixty or seventy years since the coming of white settlers, additional water had been diverted from the river and thrown on the land for irrigating purposes, and this had soaked shallow graves which before then may have been comparatively dry. It was possible to clear some of the skeletons for photography, but in most cases the bones were too fragile to be lifted. Only by the use of paraffin to strengthen the bones was it possible to save 8 complete skeletons and 23 skulls.

The death rate among children and infants was extremely high, and this fact, considered with the low mortality of adolescents, indicates the possibility of a longer life after the dangers of exposure under poor living conditions were passed during childhood. Taken as a whole, deaths among children constituted nearly 85 % of those among adults and adolescents. In the Early Period of the village settlement, slightly more children than adults died, while in the Late Period the mortality among children comes back to nearly the same proportion as in the total count.

A detailed description of the small amount that could be saved of the skeletal material is presented by Mr. W. W. Howells, pages 115-170.

LENGTH OF OCCUPANCY AND SIZE OF POPULATION
OF THE SWARTS VILLAGE

Attempt was made to estimate the time during which the village was occupied. A primary requisite for such a calculation is knowledge of the size of the population throughout the life of the community, from which, if we know the death rate, and if we find the bodies of all the dead, we can arrive at reasonably accurate results. But the size of the population of Swarts proved difficult to determine. We tried to segregate the dwellings of different families so that by approximating the size of family groups, we might estimate the number of people in the pueblo at different times. The scattered arrangement of the Early houses and the entire lack of system in the grouping of later rooms made this a baffling task.

We finally arrived, nevertheless, at an estimate of 5 people to a family, which is considered conservative and probably an underestimate, when the high death rate of infants and children is noted. An allowance of 1 room to a family in the 44 more primitive and scattered houses of the Early and Middle Period occupations would give an average population of 22 families, or 110 people; an allowance of 2 rooms would reduce it to 11 families, or 55 people. The 120 rooms of the Late Period, with an allowance of $3\frac{1}{2}$ rooms to a family, would result in the accommodation of 35 families, or 175 people, living there during that time.

In all, 1009 burials were found in the thorough clearing of the ruin and it is not likely that many were overlooked. There were 75 definitely associated with the Early occupation and the remaining 934 belonged, as far as could be seen, to the Late Period.

The following discussion by Mr. W. W. Howells, who is furnishing a report on the skeletal remains from this ruin, clearly shows how the death rate for the Swarts village was obtained:

"To determine the length of time over which a given site was occupied, we must know the total number of deaths, the death rate, and the size of the population.

"*Total Number of Burials.* This is the sole factor of which we are in possession. It is tabulated below according to age; moreover it is divided into two sections, the 'Early Period' including burials from the Early and Middle Periods lumped together. The age percentages are calculated from the totals of the sub-groups. The expedition excavated the site very thoroughly, and Mr. Cosgrove believes that very few burials were missed and that the total number would not be brought much above 1009.

AGE AT DEATH

	0-10 years	10-20 years	20-X years	Total
Early Period Burials				
Number	39	0	36	75
Per cent	52.00	0.00	48.00	...
Late Period Burials				
Number	423	29	482	934
Per cent	45.29	3.10	51.61	...
Total				1009

¹ The percentage of deaths at 0-10 years, found by Nesbitt at the Matlocks ruin in the Mimbres valley, was 45.50. (Nesbitt, 1931, *The Ancient Mimbres*, p. 45.)

Death Rate. Dr. Hooton arrived at an approximate death rate for the population of the cemetery at Madisonville, Ohio, in the following ingenious manner. He unearthed the mortality rates for nine European countries, together with the proportions of age at death, over a certain period more than fifty years ago. He assumed that, should the percentages of the age divisions agree closely with those of one of the above countries, the death rate of that country might be accepted as suitable for the Madisonville site. Switzerland fulfilled the conditions, but her death rate of 2.38 per hundred per annum was raised to 3, to allow, in this case, for burials which had escaped the spade, and for warriors dying abroad.

EUROPEAN DEATH RATES

Country	Year	Age 0-10	Age 10-20	Age 20-X	Year	Death rate per hundred
Italy	1872-77	52.37	4.22	43.41	1865-78	2.99
France	1868-77	32.28	4.25	63.47	1865-77	2.46
England	1860-70	44.23	4.56	51.21	1865-78	2.20
Prussia	1875-77	52.43	5.51	44.06	1865-78	2.72
Bavaria	1871-77	52.61	2.22	45.17	1865-78	3.09
Austria	1865-77	52.38	4.05	43.57	1865-78	3.18
Spain	1865-70	51.86	4.37	43.77	1865-70	3.12
Russia	1870-74	62.33	4.13	33.54	1865-75	3.67
Switzerland	1873-77	36.94	3.72	59.33	1870-78	2.38

"In the present case, the same figures were used, and Bavaria and England measure off with the two periods respectively. However, the figures for England are not altogether reliable, as the mortality rate and age proportions deal with different groups of the population. Moreover, further machinations will relieve us of the assumption that close correspondence in age proportions with any country entails as close a correspondence in the death rate, as of course a particular country may deviate somewhat from the postulated pattern.

"Dr. Hooton observes that there is a close correlation between infant and child deaths and the height of the rate of mortality. This is shown to be the case by dividing the death rate into the proportion of deaths under 10 years, and listing these ratios.

Country	Ratio
France	13.12
Switzerland	15.52
Austria	16.47
Spain	16.62
Russia	16.98
Bavaria	17.08
Italy	17.52
Prussia	19.64
England	20.10
Average	17.00

"Considering the fact that the majority of these ratios hover within half a point of the average, 17.00, it seems legitimate to obtain death rates for the Mimbres population by reversing the process used above and dividing the ratio 17.00 into the percentage of child and infant deaths of both groups. This gives:

Early Period	3.1 deaths per hundred per annum.
Late Period	2.7 " " " " "

The advisability of raising either of these figures is doubtful, in view of the probable peacefulness of the people and the lack of epidemics."

Since it was probable that numbers of houses fell into disuse and were left unoccupied during the time necessary to build settlements of the Early and Middle Periods which contained 172 living quarters, large communal rooms, and inclosed plazas, an allowance of either 1 or 2 rooms for the Early Periods and an average of not over $3\frac{1}{2}$ rooms to a family in the Late Period seemed logical as it gave a population commensurate with the size of the settlement.

Based on a death rate of 3.1 for the Early and Middle Periods and 2.7 for the Late, a single and a $3\frac{1}{2}$ -room assignment respectively for these periods would require 22 years to create a cemetery of 75 for the Early Periods, and 198 years to build up a cemetery of 934 in the Late times, a total occupation of 220 years. With 2 rooms to a family in the Early Periods and $3\frac{1}{2}$ rooms during the Late, the number of the first inhabitants would be decreased by one-half, which would be in better proportion for the small settlements of those times. In this way the results would show an occupation of 242 years as another estimate for the occupancy of Swarts.

We present the above calculations for what they are worth, fully realizing how many unknown quantities are involved.

RANGE OF MIMBRES CULTURE

In 1929 and 1930 surveys were made with the idea of establishing the Mimbres frontier, and of determining, if possible, the chronological relationships of this culture to its neighbors. By following the pottery types north and northwest from the Swarts Ruin, the Mimbresños were found to have worked as far north as the headwaters of the Gila River in southeastern Catron County; also up the Rio San Francisco, eighteen to twenty miles into the southwestern corner of that county. Here, as anticipated, there appeared in a number of sites, a mingling of Mimbres, Tularosa, and Little Colorado wares while in others there was strong evidence that the last two were superimposed over older Mimbres settlements. Going south into Grant County, and down the Gila River to its turn into Arizona, a widening belt along the New Mexico-Arizona line contained a noticeable increase in the amount of Mimbres sherds found in the mixed sites, of which the upper strata began to show some El Paso polychrome from the east, faint traces of Chihuahuana polychrome from the south, and an influx of late Middle Gila from the west. There was also an increase of clear-cut, large and small ruined Mimbres villages. As these settlements were on trade routes from the north and west, a natural overlapping and mixture of pottery types was to be expected in reoccupied sites, leaving here and there the original Mimbres villages uncontaminated by the remains of the late comers.¹

In the Red Rock district along the river's turn into Arizona were more towns which were distinctly Mimbres in architecture as well

¹ Emphasis has been placed on the late arrival of Little Colorado, Tularosa, El Paso polychrome, Chihuahuana polychrome, and Middle Gila pottery in this section, as our excavations at a number of sites proved that the Mimbresños had lived there many years before others brought in foreign wares. At "an unnamed ruin" in this district, now called Hill Top, Dr. Kidder first discovered that Middle Gila people, possessing El Paso polychrome and Chihuahuana polychrome with their own wares, had built their homes both over and in some of the old Mimbres houses (Kidder, 1924, *Introduction to Southwestern Pottery*, p. 103). Our subsequent digging at Hill Top continued to produce not only quantities of Mimbres sherds from below room floors but also a great many that had become mixed in the puddled adobe walls which the Middle Gila people, in repairing abandoned houses, had built on top of the remains of Mimbres rubble masonry. In addition to this discovery, excavations at lower levels brought to light a still earlier type of Mimbres house in the form of the second phase of Mimbres plaster-on-soil pit-houses, having a sloping entrance from the surface to a door in the subterranean room. The architectural progression from pit-houses to rubble masonry houses, also the arrangement and type of the later structures, together with the burials and artifacts associated with them, were found to be the same as at Swarts in the Mimbres Valley itself.

as in pottery. Only 8 intrusive sherds (Tularosa) were found at 5 ruins examined here. This stretch of the Gila Valley is somewhat isolated by protective boxes of the river above and below it, which may account for the scarcity of trade wares and also explain the entry farther north of late Middle Gila pottery through more accessible mountain passes.

As the reconnaissance passed south from Red Rock to the neighborhood of Lordsburg, the more open country disclosed few signs of occupation. Apparently the Mimbresios had worked down the Gila River into Arizona where Red-on-buff ware makes its appearance in association with typical Mimbres material. So far as is at present known, no Red-on-buff pottery has been found in the central Mimbres area. One lone sherd appeared out of collections made from 54 sites in southwestern New Mexico, which in no way alters the frontier established by Sauer and Brand along the east side of Arizona.¹ According to these authors, in several instances in southeastern Arizona the combination of Mimbres and Red-on-buff exists at lower levels, over which are found late Middle Gila at the north of their district and late Chihuahuana polychrome along the Mexico border. The Sauer and Brand extension of the Mimbres area (Figs. 1 and 3 of their report) follows a line from a site east of Safford, Arizona, on the Gila River, and through a site twelve miles south of that point. This curving line runs west about forty-five miles into Arizona, following along the mountain ranges on the west side of the San Simon Valley. In the Chiricahua Mountains it turns south to within fifteen or twenty miles of the New Mexico line and enters New Mexico in the southwestern corner of that state. In this Arizona area and inside the Mimbres frontier thus traced, are 3 Sauer and Brand sites,² which are considered by them pure Mimbres villages with a small admixture of Arizona Red-on-buff ware.

The reconnaissance made by us into southwestern New Mexico apparently straightens out the Sauer and Brand frontier, causing it to follow along the international boundary instead of dipping into Mexico as they indicated. From one of their sites near Cloverdale in southwestern New Mexico, the line seems to follow the border to Dog Spring in the southeast corner of the jog of New Mexico, thence

¹ Sauer and Brand, 1930, *Pueblo Sites in Southeastern Arizona*.

² Sauer and Brand, 1930, *Pueblo Sites in Southeastern Arizona*, pp. 435, 434, 438.

to Hermanas, possibly cutting across a small corner of Mexico, and continues east to Columbus. Further surveys into Mexico south of Hermanas and Columbus may eliminate the irregularities in the frontier and produce a more regular curve toward the Columbus district.

In this extreme southwestern corner of New Mexico, embracing the southern end of Hidalgo County, Mimbres ware was in the minority, appearing at only 6 ruins out of the 15 examined. The small ruin at Dog Spring was the only one found to be a clearly definite Mimbres site. Most of these ruins were strongly late Middle Gila and Chihuahua polychrome with an infiltration of El Paso polychrome, some Chupadero black-on-white from the east, and in some cases Little Colorado and Tularosa from the north. Excavation of a series of them may develop an underlying Mimbres culture which preceded the late comers. Without excavation and from present appearances, the touch of Mimbres wares in some of the ruins in this district and the small Mimbres ruins at Dog Spring and Hermanas seems to indicate outposts from the larger settlements to the north. On the old Kelly Ranch, about thirty miles north of the Mexican border, near the south end of the Playas Lake in the valley of that name, are a large and a small Mimbres ruin. Northeast of Hachita in the Cedar Mountains is a cluster of 4 Mimbres ruins, one of them quite a large village. These more prosperous settlements may represent an alignment of the true strongholds along the southern border that connect with the eastern frontier.

From Columbus the Mimbres trail goes north along the east side of the Florida Mountains and Cooks Peak, then back up the Mimbres Valley itself. The rather barren, sandy, open country east of the Florida Mountains in Luna County does not seem to lend itself to many settlements, although one of unknown type was reported as being situated in the drift sands about thirty miles northeast of Columbus, and apparently located near sheet-flood plains.

In Sierra County, still farther north, on the Rio Grande slopes east of the Mimbres range, Mimbres pottery occurs in considerable quantities in association with Chupadero black-on-white and other wares of that drainage. There is a possibility of finding in this strip of country a few clear-cut Mimbres outposts, but it is more than likely that there will be a pottery mixture as shown in those sites so far examined.

Traveling north from Columbus toward Deming, New Mexico, as the Mimbres Valley itself is neared, there is no question of the early supremacy of the Mimbrenos. At later times tribes came in from the east, south, and west to occupy abandoned Mimbres villages, and in some cases to build towns of their own. In the Deming district the influx of Chupadero black-on-white and El Paso polychrome wares from the east is strong in its association with the Chihuahua and Middle Gila from the south and west. The characteristics of these later cultures, though at present not segregated as to their own relationships, are recognized, not alone by the pottery but also by the puddled adobe house wall construction so prevalent in the Middle Rio Grande drainage, along the southern border of New Mexico, in northern Mexico, and also in Arizona. After completing this circuit it was found that the bounds of the Mimbres territory were well defined, and that the scope of their influence was greater than before suspected; yet withal, the highest development of the Mimbres culture still remained in the valley of that name. It was also found that the building up of the large colonies on the Gila River and those to the south did not mark an expansion or overflow from a mother settlement, but indicated a control of the whole territory at one time.

CONCLUSIONS

The Swarts village appears to have been a typical Mimbres community because its environment and the type of ruin, as well as what it contained, were much the same as found at other sites in the area. It is thought that the conditions observed at Swarts give a fairly comprehensive picture and serve well to illustrate the mode of life of the ancient Mimbrenos in general.

They were provided with sufficient fertile land and other natural food resources, causing them to be primarily agricultural, though dependent to some extent upon game. Their implements, their pottery, and such textiles as have been found in caves prove them to have possessed a general culture not unlike that of other prehistoric Pueblos.

The dwellers at Swarts and in other towns up and down the river seem to have had little fear of enemies, for their towns were built upon sites providing no protection against attack and their archi-

teecture offered but slight evidence of defensive measures. The Early and Transitional Period pit-houses with roofs at, or only slightly above, ground level, entered by hatchways in the roofs or by means of ramps, would surely have been death traps in case of attack. The later above-ground Middle Period houses had lateral doors, and only in the final period does the closer grouping of the rooms with entrance through their elevated roofs give possible indication of a fear of marauders. At all times the villages were straggling, poorly defended affairs and, taking into account the rarity of stone projectile points and other war-like implements found in the ruin, one is justified in believing that the Mimbresños led a practically undisturbed existence. The leisure thus obtained no doubt developed their latent skill in pottery decoration, and although there was little improvement seen in architecture, the large communal rooms seem to indicate an advance in social and religious organization.

There is no reason to suppose that Swarts was abandoned because of enemy pressure. There were no signs of a hurried exodus. No implements, save those of heavy stone, were left in the houses. Only a few pieces of pottery, and these mostly broken in ancient times, were found in the rooms; a cache of 4 unbroken bowls had been buried in a Late room fill and some stone axes and hoes had been hidden below floors, but these specimens were so few, considering the size of the village, that they would seem to have been forgotten or never retrieved after the place was deserted. Only 2 bodies were not buried in the regulation manner; a few without mortuary offerings may have been disposed of more hastily, yet time was taken to bury them well below the ground level or below house floors. The burning of rooms can alone be cited as possible evidence of hostile action. In the three early periods 9 out of 47 houses had been so consumed; and in the Late structures, 62 of the 125 rooms had been destroyed by fire. Even this is not surely indicative of warfare, for no stores of charred corn or scattered skeletons lay in these rooms. As the population decreased, accidental fires may have swept through uninhabited parts of the village; or, in their departure, the people may have destroyed their old homes to prevent others from using them; possibly the deserted houses were fired by passing hunters. Except for these unexplained conflagrations, which incidentally have taken place in all Mimbres

villages known to us, everything points to a gradual and voluntary abandonment of the site, seemingly with a definite idea, whether superstitious or otherwise, that it was no longer a suitable place in which to live.

The Mimbresños were apparently a peace-loving people and were also relatively isolated. They very likely controlled the output of turquoise from the mines in the Burro Mountains, and this semi-precious stone probably furnished them with a valuable medium of exchange for a limited trade with outsiders. By such barter *Olivella* and *Glycimeris* shells from the Pacific made their way to Swarts to be manufactured into beads, bracelets, and other ornaments. *Olivella* shell beads have been found in quantity at other Mimbres sites, but they were not numerous at Swarts, where they were found only with Early Period burials. As *Glycimeris* bracelets occurred in all periods, it is evident that trade relations were maintained with the west in early as well as in late times. A few *Alectrion* shells from the Gulf of Mexico were found here; they occur in greater numbers, however, at other Mimbres ruins. Several copper bells, presumably of Mexican origin, have come from the Mimbres Valley, but none from Swarts. Absence of the bells at this ruin and the small number of *Alectrion* shell beads, together with the fact that only two small sherds of proto-Chihuahuas were turned up, and these in a Late room fill, indicate meager and late contact with the south.

The status in Mimbres culture of the small stone tablets, which are analogous to the palettes of the Middle Gila, is uncertain (page 51). For this reason they cannot at present be considered as trade objects. There is also some doubt whether intercourse with Arizona was responsible for the introduction of cremation or whether the idea had its origin in the Mimbres area (page 25).

From the presence of shell from great distances and some pottery from the north, east, and south (discussed under Trade Wares, pp. 92-99), it is evident that the Mimbresños were at times in touch with the outer world. They were, however, singularly little influenced by such relations, maintaining throughout their career the strong individuality which is so well exemplified by their unique pottery.

It now becomes necessary to attempt to fit the Mimbres culture into its proper place in the general scheme of Southwestern chro-

nology. To begin with, it belongs in Pueblo III. This seems certain because of the fact that corrugated ware of obviously close relationship to that of other Pueblo III groups was found in all levels at Swarts. Furthermore, there are several reliable items of evidence which go to show that the Mimbres sites were abandoned before the rise of the cultures characteristic of Pueblo IV. To be explicit, we have found at Hill Top Ruin on Duck Creek, a tributary to the Gila River, northwest of Silver City, a direct superimposition upon Mimbres of a mixture of Middle Gila,¹ Chihuahua polychrome, and a single large sherd of Jeddito black-on-yellow (all Pueblo IV wares).

Nesbitt, at the Mattocks Ruin up the Mimbres Valley above Swarts, discovered what seems to us an early specimen of Middle Gila polychrome, in a grave of relatively late date.² Burton Cosgrove's excavations at the Galaz Ruin, also above Swarts on the Mimbres River, disclosed Middle Gila and Chihuahua wares in rooms built after the Mimbres houses had fallen into ruin.³ On the other hand, no pieces of these wares occurred at Swarts, save for the two above mentioned proto-Chihuahua fragments from a Late room. There are certain other associations which are puzzling, namely the presence, in the Late rooms at Swarts, of many fragments of El Paso polychrome and Chupadero black-on-white pottery. A complete Chupadero black-on-white bowl accompanied a burial in the fill of a Late room. From our surface survey of sites on the Gila River northwest of the Mimbres, of sites to the south toward the Mexican line, and of ruins to the east in the Alamogordo region (one excavated at Three Rivers), these wares seem to have been contemporaneous with Middle Gila and Chihuahua polychrome. Mera also believes Chupadero black-on-white to be relatively late (Pueblo IV) ware, for he equates it with Rio Grande Glaze I.⁴ Two possible solutions present themselves; the first, that El Paso polychrome and Chupadero were earlier than Middle Gila

¹ The term Middle Gila is applied to the red wares with black interior and the polychrome of the Gila-Salt River districts of Arizona. As an item of information, no Red-on-buff Arizona pottery has been found thus far in the central Mimbres area, though it appears along the southwestern frontier antecedent to the Middle Gila and, as suggested by Sauer and Brand, is possibly contemporaneous with the Mimbres ware (Sauer and Brand, 1930, *Pueblo Sites in Southeastern Arizona*, pp. 422, 427, 434, 438, 445).

² Nesbitt, 1931, *The Ancient Mimbres*, p. 98.

³ Personal information.

⁴ Mera, 1931, *Chupadero Black-on-white*.

and Chihuahua polychrome, and that their presence at sites in the regions just mentioned is due to double occupancy; the second, and probably the more likely, that in time they overlapped both Mimbres and Middle Gila-Chihushua, getting their start during the ascendancy of the former, and persisting into the period of the latter. Further research, in which digging should certainly reinforce surface observation, will clear up these points. In the meantime, we believe the weight of evidence to indicate that the Mimbres culture had surely passed away before the development of the Pueblo IV groups on the Middle Gila and in Chihuahua.

If the Mimbres belongs in Pueblo III, we must try to locate it as accurately as possible within that period. Here again we have some data which seem clearly interpretable, others which are baffling. At Swarts there were found St. Johns polychrome (Little Colorado black-on-red) sherds; also, with a cremation, 2 Tularosa fillet-rim bowls and certain black-on-white vessels and fragments which have a strong Tularosa look. These occurrences all seem late. The cremation may have been intrusive; it was accompanied by an El Paso polychrome olla (Plate 18). At the Villareal Ranch on the Gila River (Ruin 9 of the Museum survey) Tularosa black-on-white and corrugated wares were discovered in stratigraphic position above Mimbres. At a site named "Pottsville" near Hill Top Ruin, mentioned above, was a Middle Gila Ruin with the typical puddled adobe wall construction. Here, in conjunction with Middle Gila polychrome wares, were St. Johns polychrome, a Zuni type of green glaze on white slip, also a black glaze on white slip combined with flat color, Tularosa black-on-white and corrugated, and El Paso polychrome. Again some Mimbres sherds came from the lower levels. A like condition was seen at a ruin on the Laramore Ranch on Mule Creek, a southern tributary to the Rio San Francisco, where Tularosa and St. Johns polychrome were noted as overlying Mimbres. Mimbres would thus appear to have existed before the Tularosa-St. Johns complex, and the investigations of Haury and Hargrave have shown that the second member of this group belongs in late Pueblo III.¹ At Swarts, in a Late grave, there appeared a St. Johns polychrome bowl. From refuse under floors we recovered 9 black-on-white sherds which appear to have come from the Little Colorado and to represent a middle Pueblo III

¹ Haury and Hargrave, 1931, *Recently Dated Pueblo Ruins in Arizona*.

horizon. We now seem to have clear evidence that Mimbres should be assigned to middle Pueblo III, but there were also found at Swarts 2 authentic Pueblo I fragments,¹ and parts of 2 vessels which Frank H. H. Roberts, Jr., believes to be early Pueblo II or possibly late Pueblo I. To add to the confusion, Kidder found at Forked Lightning Ruin, a very late Pueblo III Black-on-white site in the Pecos Valley (containing Mesa Verde and Chupadero black-on-white, Tularosa corrugated, and much St. Johns polychrome), an undoubtedly Mimbres sherd and 2 other probable ones;² a Mimbres fragment was discovered by K. M. Chapman at another late Black-on-white village at Lamy, New Mexico; and N. M. Judd took part of a Mimbres bowl from a late horizon in the Chaco Canyon.³

If we accept the above evidence of the earliest and latest possible association, we get a total range for Swarts, and inferentially for the development of Mimbres culture, extending from Pueblo I well into Pueblo IV, in other words, from perhaps 500 to 1500 A.D., which is manifestly absurd. We believe, as has been stated in the section on the length of occupancy of Swarts, that the place was not inhabited over two hundred and fifty years. Our surmise is that even this period is perhaps too long, that the Pueblo I pottery cannot be of contemporary manufacture, and that Mera has probably placed Chupadero too late. Our present opinion, in which Kidder concurs, is that the two centuries between 950 and 1150 A.D. will eventually prove to have covered the life of the Swarts village.

In closing, it may not be out of place to make certain recommendations for future work. Swarts, Cameron Creek, and the Mattocks Ruin, the only Mimbres sites so far reported upon, all belong to the fully developed stage of Mimbres culture. Although it is true that the excavations show Swarts to have passed through a development from crude underground habitations to dwellings entirely exposed on the surface, nothing was found at that site to illustrate the earliest development of Mimbres pottery. The wares recovered by us represent, on the other hand, the very peak of Mimbres ceramic art. Some other sites nearby appear to show a degeneration. The pit-houses which occur below the Cameron Creek, Mattocks, and

¹ Identified independently by Kidder and Guersey.

² Kidder, 1931, *The Pottery of Pecos*.

³ Personal information.

Swarts ruins do not, in our opinion, represent a period greatly antedating the masonry-built pueblos overlying them. Mimbres origins, then, are still entirely unknown. Bradfield discovered at Three Circle Ranch, near the head of the valley, some round pit-houses with crude and seemingly early pottery. As his untimely death has made it unlikely that the results of this, his last, excavation will be put forth in the detailed and accurate way in which he would have published them, it becomes of great importance to locate and examine other remains of similar type. Work upon them should provide valuable information regarding early house forms as well as permit reconstruction of a definite pottery sequence leading to the perfection attained in later times. This work will not result in the recovery of spectacular artifacts, but it is imperative that we obtain architectural and ceramic data on the primary phase.

In the Mimbres, excavation of house clusters has heretofore appeared to be of first importance, while the large circular depressions which are frequently found near the villages, and which are undoubtedly the remains of kivas or ceremonial rooms, have been neglected. In this report the large room, AE, suggesting a communal room, is described on page 10, and another room, 7-15, having a ventilating system not unlike that of a kiva, is described on page 22, and illustrated on Plates 16 and 17. In 1923 the authors found the first kiva-like room in the Mimbres area.¹ In 1927 Bradfield discovered similarly ventilated rooms at Cameron Creek,² and at the same place he also excavated an outlying circular depression which proved to be a very large ceremonial or communal room. Variation in the so-called Mimbres kiva or ceremonial room must occur and should be brought to light by more digging in the large depressions found outside ruins in the district. At a ruin known to the authors in the northwestern part of the Mimbres country there appears to be a large circular structure incorporated in the building itself. Whether this is an example of the Mimbres rectangular kiva or of the circular kiva form of the north, only excavation will tell.

It is also necessary to do more work along the Mimbres outskirts, where overlapping of pottery types occurs, and thus close

¹ Congrove, 1923, *Two Kivas at Treasure Hill*, pp. 18-21.

² Bradfield, 1927, *Notes on Mimbres Culture*, p. 553.

the gaps in the Mimbres frontier. Aside from this, additional knowledge would be gained as to the interrelation of outside cultures which might clarify the picture of the Mimbresños themselves, with the chance of tracing their origin and of learning what became of them. It has been suggested that the Mimbresños might have been absorbed by other people, but there is little Mimbres influence seen in the design on late pottery intrusions to show that this was the case. When foreign pottery made its appearance it was at the very end of the Mimbres régime, a time marked by an apparent concentration of the Mimbresños into a central locality, after which they abandoned their homes and disappeared. Following this, outsiders began to encroach upon their territory, as is shown by their building distinctly non-Mimbres villages over the remains of Mimbres settlements along the frontiers.

Finally, the necessity of gathering and recording the perishable artifacts that have been preserved in the dust of dry caves and shelters is apparent. Due to the decay of such objects in open ruins, cave material is important as adding to the history of the people who lived near these natural shelters and may at one time have occupied them. Moreover, the continuation of this work is of paramount importance because the stratified deposits laid down by early and late occupants of such caves are rapidly being destroyed, and the unrecorded specimens carried away and dispersed as a result of unauthorized digging.

THE SKELETAL MATERIAL

BY WILLIAM WHITE HOWELLS

INTRODUCTION

This report deals with a collection of that skeletal material which was brought back from the Swarts Ruin in the Mimbres Valley in southwestern New Mexico by Mr. and Mrs. Cosgrove. At the site, the location of the graves in a valley bottom where periodic flooding by the river has been supplemented by irrigation in recent years is responsible for the destruction of more than nine-tenths of the human remains. Although the Cosgroves uncovered 1009 burials in a very thorough search, they were able to save only 8 skeletons, 20-odd crania, and a number of other fragments by impregnating them with paraffin immediately upon exposure. The condition of these is none too good.

A tabulation of the material follows:

	Skeletons	Crania	Calvaria	Upper Jaws and Mandibles	Total
Male	3	8	6	11	28
Female	2	0	4	14	20
Sub-adult	3	5	0	6	14
Total	8	13	10	31	62

Age. The age distribution of all the burials at the site as observed by Mr. and Mrs. Cosgrove is as follows:

	Adults	Adolescents	Children	Infants	Total
Early Period	36	0	9	30	75
Late Period	482	29	120	303	934
Total	518	29	129	333	1009

Age in the surviving material was determined by the eruption of the teeth in sub-adults, and in adults by the wear of the teeth and by the closing of the cranial sutures. However, it is doubtful

whether the age distribution in so small a series is in itself of the slightest importance, and accordingly, no detailed table has been made of it. Moreover, it is probable that the conditions to which the burials were subjected acted as a selective factor with regard to age.

Sex. Of 187 adults in the field on whom sex was observed 107 were males and 80 were females, a proportion of 133.75 males to every 100 females. Referring to the present material, the proportion is 28 to 20 or 140 males to 100 females. This ratio for similar peoples is:

Pecos skeletons	over 10 years	140.8
Jemez, living,	" " "	128.9 ¹
All Tanoan-speaking	" " "	108.7 ¹

It is worthy of notice that Dr. Hooton has remarked that a high percentage of males is usual in a declining population.

Sex was established according to standard cranial criteria, supplemented when possible by observations on the pelvis. However, the sex, in the case of any individual who might be termed doubtful, was not definitely assigned until measuring and observing were completed; thus it is hoped that observations were not influenced in any degree by a presupposition on the part of the observer.

Method of Statistical Comparison. It is doubtful if so small a series is capable of giving entirely satisfactory results when subjected to thorough statistical analysis while standing on its own feet. Therefore, it is proposed to make use of the series from Pecos Pueblo of over 200 individuals which has been exhaustively investigated by Dr. Earnest Hooton in his "The Indians of Pecos Pueblo," which stands alone in the anthropology of the Southwest. We shall meticulously compare the two series in each measurement and observation, not only for purposes of comparison, but also in order to glean an idea as to how far the data on our own series may be trusted, since they are apt to be scant. In fact, we shall shamelessly hitch onto the Pecos series all the way and form conclusions on the basis of what has been revealed under the skilful hands of Dr. Hooton.

Statistical Constants. The arithemetical mean and the range covered by the series are given in all cases. When the number included falls below 10 only the mean has been calculated.

¹ Census of 1910

The standard deviation gives the average deviation of individuals from the mean.

The coefficient of variation expresses the standard deviation as a percentage of the mean, thus reducing standard deviations of all measurements to a common denominator and making them comparable.

The probable error of the mean, etc., corrects for possible errors due to sampling and gives the limits of variation from the mean within which the ideal mean of such a series may be expected to fall fifty percent of the time.

CRANIAL MEASUREMENTS

Deformation. There is an excellent discussion of the kinds, probable causes, and significance of artificial deformation in the Southwest in Dr. Hooton's "Indians of Pecos." Suffice it to say here that the same types and degrees of deformation are found in the Mimbres collection.

In Dr. Hooton's tables, "all crania with a very slight occipital deformation are regarded as undeformed, as it seems improbable that the cranial index has been much altered by the slight amount of deformation suffered." In the Mimbres series I could find only one undeformed skull; the rest all exhibited too marked a degree of deformation to be put in such a category as the above. These observations seem to be confirmed by the approximation of the cranial indices of the two series in both sexes.

As to figures, the table shows that the curves for both groups are perfectly symmetrical. There is a consistent sex difference: the males of both groups are more strongly deformed, while the females tend toward the submedium end. These trends are not very marked, and though they are interesting, I can make no plausible suggestion as to the reason. The noteworthy fact at present is that a medium degree of deformation is the mode, and that there is some degree distinguishable in almost every specimen.

Correction for Deformation. Dr. Harry Shapiro has devised a statistical formula for deriving the hypothetical undeformed means for the diameters of a series of deformed skulls, by correlating each of the three measurements with some other cranial measurement or index which is not affected by deformation.¹ For instance, in a

¹ Shapiro, 1928, *A Correction for Artificial Deformation of Skulls*.

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large number of undeformed series, Dr. Shapiro obtained a high coefficient of correlation between head length and basion-nasion length. Thereupon he calculated by means of a regression formula the amount of change in head length for every unit change in basion-nasion length, the result being 1.49.

This constant is used as follows: first, if there are undeformed crania in the same group as the deformed, the mean head length of the latter is restored by finding the difference between the two means of basion-nasion length, multiplying this by 1.49, and adding or subtracting, according to the sign, this result from the mean

DEGREE OF DEFORMATION

		Absent	Slight	Medium	Pronounced	Very Pronounced	Total
Males:	N	1	3	4	5	1	14
	%	7.14	21.43	28.57	35.71	7.14	
Pecos:	N	10	47	55	55	7	174
	%	5.75	27.01	31.61	31.61	4.02	
Females:	N	0	3	2	1	0	6
	%	0.00	50.00	33.33	16.67	0.00	
Pecos:	N	3	31	53	24	4	117
	%	2.56	26.50	47.01	20.51	3.42	
Total:	N	1	6	6	6	1	20
	%	5.00	30.00	30.00	30.00	5.00	
Total Pecos:	N	40	149	244	157	25	615
	%	6.50	24.23	39.67	25.53	4.07	

At the site it was noted that 7 out of 515 adults were undeformed, or 1.35%.

head length of the undeformed. Secondly, if there are *no* undeformed crania, the necessary means to be used are supplied by interracial means calculated from 90 random series taken all together.

The other two diameters are corrected in the same manner. A "cranial module index" (deformed cranial module mean ÷ corrected cranial length) is used in the correction of the maximum breadth. The breadth-height index is corrected from the cranial breadth, and then is multiplied by the cranial breadth to give the corrected height; Dr. Shapiro is not entirely satisfied with this latter correction, pointing out that it magnifies any error in the correction of the width. He offers as a substitute the device of subtracting the sum of the corrected length and breadth from the sum

of the three uncorrected diameters, which is based on the supposition of complete compensation in deformed skulls. The whole method is hardly to be used on individual crania, but its value in restoring approximate means is quite obvious.

The present series has no undeformed crania. If Dr. Shapiro's interracial means are used in correction, the results are unreasonable, due, I think, to the markedly small cranial vaults of the whole group. A far better method is found in using the undeformed Pecos series in the corrections, in consideration of the close similarity of the two groups. The height is found by the subtraction method. On the whole, the results appear to be highly satisfactory.

Diameters and Indices of the Vault. The significance of the means of the three primary measurements of the cranium is vitiated by the fact of deformation. Suffice it to say that quantitatively the crania are short, though of medium breadth, and that the means of both measurements fall short of the Pecos means by an amount that is statistically significant. In height the two series are perhaps about the same.

The cranial index is, of course, strongly brachycephalic. The length-height index in both sexes is strongly hypsicephalic, while the breadth-height index is barely acrocephalic. The cranial module is 6 units higher in males than females.

The minimum frontal diameter is, in the case of males at least, smaller in Mimbres than in Pecos crania. It is fairly narrow in an absolute sense.

Corrected Diameters and Indices. The corrected cranial diameters are very interesting. We may take it for granted that they are approximate, at least. The corrected length is about 1 cm. longer than the deformed length, and the width is slightly less (although in females, fractionally more). The male cranial index, though reduced, is still brachycephalic, while the corrected Pecos index is mesocephalic. Dr. Hooton has put forward the belief that normally round heads are, from their very shape, more liable to accidental occipital deformation in infancy than long heads; and this theory may be offered in explanation of the universality of deformation among Mimbres crania, as compared with those from Pecos.

The basion-bregma height is considerably reduced in correction in both sexes, and so, accordingly, is the length-height index, though the latter is still hypsicephalic. The breadth-height index,

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although only slightly lowered (since the cranial width is also reduced in correction), nevertheless in both sexes passes from acrocephaly into metriocephaly.

GLABELLO-OCCIPITAL LENGTH

	N	R	M	SD	V
Males, deformed . . .	10	189-175	169.60 \pm 1.95	9.14 \pm 1.38	5.69 \pm 1.21
Pecos	95	140-187	164.28 \pm 0.59	8.46 \pm 0.41	5.15 \pm 0.25
Males, undeformed . . .	1	...	176		
Pecos	46	158-198	175.74 \pm 0.81		
Females, deformed . . .	5	151-162	157.41		
Pecos	71	144-179	159.66 \pm 0.66		

MAXIMUM BREADTH

	N	R	M	SD	V
Males, deformed	9	135-148	142.33 \pm 0.86	3.83 \pm 0.61	2.69 \pm 0.60
Pecos	91	132-159	145.43 \pm 0.43	6.13 \pm 0.31	4.22 \pm 0.21
Males, undeformed	1	...	159		
Pecos	45	122-160	157.84 \pm 0.62		
Females, deformed	3	129-141	136		
Pecos	68	121-154	141.35 \pm 0.44		

BASION-BREGMA HEIGHT

	N	R	M
Males, deformed	9	137-151	141.83
Pecos	80	129-150	140.69 \pm 0.39
Males, undeformed	1	...	143
Pecos	34	121-152	137.14 \pm 0.75
Females, deformed	3	133-137	134.80
Pecos	55	127-148	135.24 \pm 0.36

CRANIAL INDEX

	N	R	M
Males, deformed	9	77-95	87.43
Pecos	91	73-102	88.93 \pm 0.44
Males, undeformed	1	...	78.96
Pecos	43	68-88	78.30 \pm 0.49
Females, deformed	3	60-93	86.48
Pecos	68	68-104	88.90 \pm 0.53

LENGTH-HEIGHT INDEX

	N	R	M
Males, deformed	6	85-90	87.83
Pecos	89	72-101	85.78±0.38
Males, undeformed	1	---	81.25
Pecos	34	70-89	78.11±0.46
Females, deformed	5	88-99	83.72
Pecos	53	73-93	85.14±0.40

BREADTH-HEIGHT INDEX

	N	R	M
Males, deformed	6	95-107	98.98
Pecos	78	86-108	96.94±0.36
Males, undeformed	1	---	102.88
Pecos	33	89-111	99.33±0.57
Females, deformed	5	96-104	99.24
Pecos	53	87-104	95.28±0.35

CRANIAL MODULE

	N	R	M
Males, deformed	6	143.67-153.00	148.89
Pecos	80	136.67-160.67	150.04
Males, undeformed	1	---	132.67
Pecos	33	140.00-163.33	150.48±0.60
Females, deformed	5	138.33-146.67	142.73
Pecos	34	139.67-153.00	145.20±0.28

MINIMUM FRONTAL DIAMETER

	N	R	M	SD	V
Males, deformed	14	83-98	92.79±0.67	3.74±0.48	4.05±0.73
Pecos	93	83-112	94.92±0.34	4.83±0.24	5.09±0.23
Males, undeformed	1	---	102		
Pecos	50	82-111	94.94±0.60		
Females, deformed	5	88-96	92.00		
Pecos	95	82-104	92.41±0.51		

DIAMETERS AND INDICES OF THE CRANIAL VAULT
CORRECTED FOR DEFORMATION

	Males	Pecos	Females	Pecos
Glabello-occipital Length . . .	159.48	174.67	163.02	162.93
Maximum Breadth	140.04	137.23	137.06	139.60
Basion-bregma Height	135.10	139.11	129.15	134.70
Length-breadth Index	82.63	78.83	84.08	85.06
Length-height Index	79.66	79.92	78.60	82.66
Breadth-height Index	90.41	101.33	93.48	97.17

Cranial Circumference and Arcs. There is practically no difference in the means of the cranial arcs or circumference between the Mimbres series and the Pecos deformed crania in either sex. In all three measurements, the male mean is about 1 cm. greater than the female mean.

MAXIMUM CIRCUMFERENCE

	N	R	M
Males, deformed	7	478-501	489.00
Pecos	90	440-530	493.35 \pm 1.06
Females, deformed	4	469-485	477.50
Pecos	66	450-505	479.32 \pm 1.04

NASION-OPISTHION ARC

	N	R	M
Males, deformed	6	339-370	353.00
Pecos	85	320-380	354.62 \pm 0.92
Females, deformed	4	331-349	342.00
Pecos	62	320-370	343.71 \pm 1.03

TRANSVERSE ARC

	N	R	M
Males, deformed	9	312-343	329.22
Pecos	91	297-357	329.75 \pm 0.90
Females, deformed	5	295-337	316.40
Pecos	68	297-340	320.59 \pm 0.92

Cranial Capacity. The crania are in such poor condition that of the deformed males, only three could be measured; these give an average of about 1250 cc., which is over 100 cc. less than that of the deformed Pecos males. However, I do not believe that this figure is representative, especially as paraffin was used to preserve the skulls, and this has glued some of the original earth to the inside of the cranium, whence it cannot be removed.

Karl Pearson¹ devised the following formula for the reconstruction of the cranial capacity from the three diameters:

$$524.6 + (\text{Length} \times \text{Breadth} \times \text{Height} \times .000,266) =$$

Cranial Capacity in cc. (Length, breadth, and height are in millimeters).

CRANIAL CAPACITY

	N	R	M
Males, deformed	3	1190-1280	1249.33
Pecos	68	1110-1560	1367.04 = 8.18
Males, undeformed	1	. . . . .	1420
Pecos	31	1030-1550	1338.71 = 14.30
Females, deformed	1		1170
Pecos	54	1050-1480	1254.07 = 7.66

When applied to the Pecos undeformed crania and compared with the measured capacity, it gives rather inaccurate results; it does not even err consistently. For males, the calculated capacity is 1408 cc., or 70 cc. more than the actual capacity, while for females it is 1329, or over 100 cc. too great. Now, the corrected measurements of the Mimbres crania give a restored capacity of 1377. This is probably about 70 or 80 cc. too great, but not much more; I am sure it is not as low as 1250. Therefore, I hazard a guess that the ideal average for the male series is about 1300 cc.

The restored female capacity is 1286, and this is probably about 100 cc. in excess of the actual mean, which, we may suppose, falls in the vicinity of 1180 or 1190.

The above figures are to be considered as no more than guesses, but guessing is in this case the only method of arriving at a conclusion. These are very low figures for cranial capacity; slightly

¹ Pearson, 1920, *Reconstruction of Cranial Capacity from External Measurements*.

greater than those for Australians, and approximately 100 cc. lower in both sexes than average figures for American Indians.

Mean Diameter of Foramen Magnum. There is nothing worthy of note concerning the mean diameter of the foramen magnum, except that, as one expects, the males exceed the females by about 2 millimeters.

MEAN DIAMETER OF FORAMEN MAGNUM

	N	R	M
Males	5	29-32.5	31.20
Pecos	102	25-35	30.93±0.12
Females	5	28.5-30.5	29.40
Pecos	73	26-32	29.07±0.13

Thickness of Left Parietal. It is interesting that the parietal bone should be insignificantly thicker in Pecos females than in males; this condition, however, does not prevail in the Mimbres Valley crania.

Two fragments of an undoubtedly pathological skull gave the following thicknesses: frontal bone, 18 mm.; right parietal, 16 mm.

THICKNESS OF LEFT PARIETAL

	N	R	M	SD	V
Males	11	5.9-7.3	5.27±0.25	1.21±0.17	21.93±4.46
Pecos	141	3-8	5.16±0.05	0.90±0.04	18.60±0.74
Females	5	4-6	5.00		
Pecos	94	3-8	5.24±0.05		

Facial Diameters and Indices. The measurements of the face are large medium. Though they are smaller than those of the Pecos crania, the difference in the nasion-prosthion height is very slight; and this is the only series large enough to be treated statistically.

Whatever difference may exist between the two groups is not indicial. The Total Facial Index is low mesoprosopic. The Upper Facial Index is mesene, and very much in the center of the scale.

MAXIMUM BIZYGOMATIC DIAMETER

	N	R	M
Males	4	129-137	133.50
Pecos	102	122-161	138.56 \pm 0.41
Females	2	127-129	128.00
Pecos	68	118-138	129.87 \pm 0.27

NASION-MENTON HEIGHT

	N	R	M
Males	7	112-124	116.43
Pecos	107	107-135	119.28 \pm 0.36
Females	1	....	110
Pecos	71	100-125	113.31 \pm 0.47

NASION-PROSTHION HEIGHT

	N	R	M	SD	V
Males	10	68-78	71.60 \pm 0.69	3.23 \pm 0.49	4.51 \pm 0.96
Pecos	112	64-84	72.83 \pm 0.25	3.95 \pm 0.18	5.42 \pm 0.24
Females	4	60-73	68.25		
Pecos	75	59-77	69.04 \pm 0.27		

TOTAL FACIAL INDEX

	N	R	M
Males	4	84-87	85.60
Pecos	86	70-99	85.69 \pm 0.35
Females	1	...	85.27
Pecos	59	76-96	86.95 \pm 0.38

UPPER FACIAL INDEX

	N	R	M
Males	4	51-58	52.26
Pecos	90	43-59	52.09 \pm 0.23
Females	2	51-52	51.57
Pecos	61	46-60	53.00 \pm 0.23

Orbits. The orbits are insignificantly broader and lower in the Mimbres male crania than in the Pecos, but enough so to make a slight significant difference in the index, which is high mesoconch.

ORBIT BREADTH

		N	R	M	SD	V
Males:	Right ..	12	37.3-42	40.00±0.27	1.40±0.19	3.50±0.68
	Left	13	37-43	40.00±0.29	1.55±0.21	3.89±0.75
Pecos:	Right ..	119	35-44	39.90±0.11	1.82±0.08	4.56±0.20
	Left	117	35-49	39.47±0.12	1.89±0.12	4.65±0.20
Females:	Right ..	4	36-41	37.75		
	Left	4	37-41	39.38		
Pecos:	Right ..	80	34-43	38.40±0.12		
	Left	77	34-42	38.14±0.11		

ORBIT HEIGHT

		N	R	M	SD	V
Males:	Right	12	32-36	34.33±0.24	1.23±0.17	3.56±0.70
	Left	13	32-41	34.96±0.30	2.10±0.28	6.01±1.12
Pecos:	Right	119	31-38	34.80±0.10	1.61±0.07	4.62±0.30
	Left	117	30-38	34.90±0.10	1.60±0.07	4.60±0.20
Females:	Right	4	31-36	33.50		
	Left	3	32-35	33.33		
Pecos:	Right	80	29-37	34.22±0.12		
	Left	78	29-41	34.49±0.14		

ORBITAL INDEX

	N	R	M	SD	V
Males	12	80-92	86.60±0.76	3.92±0.54	4.35±0.80
Pecos	120	73-99	87.80±0.28	4.57±0.20	5.21±0.23
Females	4	85-94	87.99		
Pecos	83	76-98	89.87±0.36		

The females are too few for comparison; the suggestion is that they, like the Pecos females, are more hypsiconch.

No differences can be determined as to side.

Nose. The nasal aperture is fairly broad. The male Mimbres noses are significantly shorter and broader than the Pecos, and the

index is higher, being well within the bounds of platyrrhiny. In the females, unreliable as always, the same differences are present in a lesser degree. Of the two sexes, the females, as in the Pecos series, are slightly more platyrrhine.

NASAL HEIGHT

	N	R	M	SD	V
Males	12	47-54	49.67±0.43	2.21±0.30	4.45±0.87
Pecos	125	45-57	50.96±0.10	2.74±0.12	5.38±0.32
Females	5	49-50	47.70		
Pecos	86	49-53	48.20±0.16		

NASAL BREADTH

	N	R	M	SD	V
Males	13	25-30	27.31±0.24	1.26±0.17	4.65±0.87
Pecos	120	21-30	25.80±0.09	1.57±0.07	7.08±0.26
Females	4	24-26	25.00		
Pecos	86	21-30	25.33±0.13		

NASAL INDEX

	N	R	M	SD	V
Males	12	47-57	52.42±0.48	2.46±0.34	4.70±0.92
Pecos	124	40-65	50.44±0.26	4.27±0.18	8.46±0.39
Females	4	51-58	53.19		
Pecos	86	42-62	52.00±0.30		

Palate. The male palatal indices of the Mimbres and Pecos crania might be called statistically identical. Both are brachyuranic; that is, the palate is short in relation to its width. The Mimbres palates are slightly the larger, which is surprising in view of the fact that the faces and vaults are smaller; it should be remarked, however, that they are at the same time more prognathous.

The female index is higher than the male, contrary to the Pecos sex difference.

PALATE LENGTH

	N	R	M	SD	V
Males	12	51-59	55.92 \pm 0.39	2.02 \pm 0.28	5.61 \pm 0.50
Pecos	100	48-63	55.04 \pm 0.19	2.82 \pm 0.15	5.12 \pm 0.24
Females	5	50-54	52.60		
Pecos	66	48-61	53.97 \pm 0.22		

PALATE BREADTH

	N	R	M	SD	V
Males	11	61-71	66.18 \pm 0.59	2.92 \pm 0.42	4.41 \pm 0.63
Pecos	97	58-73	65.59 \pm 0.32	3.29 \pm 0.16	5.02 \pm 0.24
Females	6	62-69	64.67		
Pecos	66	55-69	62.74 \pm 0.22		

PALATAL INDEX

	N	R	M	SD	V
Males	11	112-131	119.36 \pm 1.09	5.36 \pm 0.77	4.49 \pm 0.91
Pecos	97	103-136	119.16 \pm 0.44	6.42 \pm 0.31	5.42 \pm 0.26
Females	5	119-128	121.57		
Pecos	66	100-132	116.92 \pm 0.52		

Prognathism. The mean male gnathic index is distinctly prognathous, being above 102.5. This is not entirely due to the presence of one excessively prognathous specimen (Plate 235), for 3 out of 6 individuals within the group are prognathous and only 1 orthognathous. This is strikingly different from the Pecos crania, where the index and 68 per cent of individuals are orthognathous, while prognathism is very rare, occurring in only 3 per cent.

The females of both groups are mesognathous, though the indices differ by several units.

BASION-NASION LENGTH

	N	R	M
Males, deformed	8	91-102	98.50
Pecos	67	92-109	101.58 \pm 0.29
Females, deformed	5	92-100	97.20
Pecos	40	89-108	97.15 \pm 0.43

BASION-PROSTHION LENGTH

	N	R	M
Males, deformed	6	94-105	101.00
Pecos	65	91-106	97.51 \pm 0.30
Females, deformed	4	95-100	97.75
Pecos	40	85-107	95.32 \pm 0.51

GNATHIC INDEX

	N	R	M
Males, deformed	6	96-115	102.73
Pecos	65	90-108	98.00 \pm 0.27
Females, deformed	4	99-103	101.24
Pecos	39	91-105	97.92 \pm 0.35

Mandible. With the exception of the condylo-symphysial length the Mimbres mandibles are smaller in all measurements than the Pecos mandibles in both sexes; and significantly so at least in the male bigonial diameter and height and breadth of the ascending ramus. This smaller bigonial width is interesting in view of the fact that the Mimbres palates are slightly, though not significantly, broader.

The most marked sex difference is to be found in the breadth of the ascending ramus.

BIGONIAL DIAMETER

	N	R	M	SD	V
Males	10	91-106	97.10 \pm 1.16	5.42 \pm 0.82	5.58 \pm 1.19
Pecos	102	88-117	101.56 \pm 0.47	7.11 \pm 0.34	7.00 \pm 0.33
Females	3	90-98	93.67		
Pecos	62	83-109	94.47 \pm 0.40		

BICONDYLAR WIDTH

	N	R	M
Males	4	112-124	118.00
Pecos	83	109-138	122.34 \pm 0.45
Females	1	.....	122
Pecos	48	105-128	115.27 \pm 0.60

HEIGHT OF SYMPHYSIS

	N	R	M	SD	V
Males	18	31-40	35.00±0.41	2.60±0.29	7.44±1.15
Pecos	102	29-43	35.40±0.17	2.50±0.12	7.08±0.33
Females	5	31-38	33.00		
Pecos	79	28-41	33.65±0.20		

MINIMUM BREADTH OF ASCENDING RAMUS

	N	R	M	SD	V
Males	15	32-40	35.80±0.34	1.97±0.24	3.51±0.96
Pecos	125	30-44	36.92±0.17	2.90±0.12	7.84±0.33
Females	7	31-36	32.86		
Pecos	85	29-43	35.75±0.17		

HEIGHT OF ASCENDING RAMUS

	N	R	M	SD	V
Males	13	54-71	60.77±0.95	5.06±0.67	8.32±1.56
Pecos	116	48-73	62.83±0.38	6.01±0.25	9.50±0.42
Females	5	52-56	53.60		
Pecos	79	46-63	55.02±0.31		

CONDYLO-SYMPHYSEAL LENGTH

	N	R	M
Males	5	93-118	105.80
Pecos	94	92-117	104.62±0.52
Females	1	....	104
Pecos	61	90-114	101.48±0.44

STATURE

In the restoration of the stature of an individual from almost any one of, or combination of, the long bones, we may use a set of formulae concocted by Karl Pearson.¹ I seriously doubt the efficacy of these particular formulae when applied to Indians, from the fact that they postulate fixed bodily proportions, which latter vary considerably between racial groups. My objection is sustained by

¹ Pearson, *A Study of the Long Bones of the English Skeleton*, p. 3.

finding that if two or more different formulæ are used on the same individual (Indian), the results will differ by from two to six centimeters. However, by using a single formula Dr. Hooton seems to have arrived at a reasonable result with the Pecos skeletons.

In this case the formula used was that combining the femur and the tibia, which gave the following results:

Males	161.74	0.24 cms.
Females	150.11	0.24 cms.

These heights are below the averages for any of the present day Rio Grande pueblos, and fairly low for Southwestern and Mexican Indians generally.

The Mimbres skeletons comprise three males and two females, but these are not present in all their parts. To make up for individual deficiencies, I computed the stature from each available long bone by its special formula, and took an average of these for each individual. The results are:

Male	Female
161.17	152.85
165.34	156.39
159.95	....
162.15	154.62

It may be remarked that 2 out of 3 of the males fall below the Pecos mean. However, the statures of these 2, when calculated only by the femur-tibia formula, both land above the same mean. It is apparent, then, that the Mimbresños, if not taller, were no shorter than the Pecos Indians, woefully scant though the data may be.

CRANIAL OBSERVATIONS

A general conclusion as to the distribution by percentages in the different observations may be remarked. In such a small series, the value in percentage of each frequency is high. This tends either to neglect or to overemphasize the extreme categories of any observation, from the same cause. However, it is not difficult to tell when this is the case, especially with the Pecos series for comparison, and to pass judgment on the real significance of the distribution. Even

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so small a sample as the present one may be taken as highly indicative.

Frontal Region. None of the crania show a pronounced height or breadth of forehead; on the whole they seem narrower than those from Pecos. The phenomenon, observable at Pecos, of more receding foreheads in females, is not seen here; as is usual, the males are more receding. Moreover, they are also more receding than the Pecos males.

Large supraorbital ridges are common among the males; more so than at Pecos. The females are distributed normally. As to form, the males are almost all of Type II. This consists of a V at glabella, supplemented by, but separated from, thickenings over the upper external corner of the orbit; the whole formation is something like an inverted W with all the angles cut off. There are two cases of the torus, or Type III. The Pecos group falls largely into group I, that of the median V. This bears out the observation of smaller-sized ridges.

The females, as is to be expected, fall mostly into Type I.

HEIGHT OF FRONTAL REGION

		Submedium	Medium	Pronounced	Total
Males:	N	4	12	0	16
	%	25.00	75.00	0.00	
Pecos:	N	44	75	20	139
	%	31.66	53.96	14.39	
Females:	N	1	5	0	6
	%	16.67	83.33	0.00	
Pecos:	N	59	58	9	99
	%	59.58	58.59	9.03	

BREADTH OF FRONTAL REGION

		Submedium	Medium	Pronounced	Total
Males:	N	7	9	0	16
	%	43.75	56.25	0.00	
Pecos:	N	35	65	39	139
	%	25.18	46.76	28.06	
Females:	N	2	4	0	6
	%	33.33	66.67	0.00	
Pecos:	N	32	47	20	99
	%	32.32	47.47	20.20	

SLOPE OF FRONTAL REGION

		Steep	Medium	Receding	Total
Males:	N	0	9	7	16
	%	0.00	56.25	43.75	
Pecos:	N	51	91	17	159
	%	22.50	65.47	12.23	
Females:	N	0	5	1	6
	%	0.00	83.33	16.67	
Pecos:	N	11	42	46	99
	%	11.11	42.42	46.46	

SIZE OF SUPRAORBITAL RIDGES

		Absent	Submedium	Medium	Large	Very Large	Total
Males:	N ..	0	3	7	7	0	17
	% ..	0.00	17.65	41.65	41.65	0.00	
Pecos:	N ..	1	36	74	25	5	139
	% ..	0.72	25.89	53.23	17.99	2.08	
Females:	N ..	1	3	1	0	0	5
	% ..	20.00	60.00	20.00	0.00	0.00	
Pecos:	N ..	30	57	13	2	0	102
	% ..	29.41	55.88	12.74	1.96	0.00	

TYPE OF SUPRAORBITAL RIDGES

		Absent	Median	Medium I	Medium II	Medium III	Total
Males:	N ..	0	0	1	14	2	17
	% ..	0.00	0.00	5.88	82.35	11.76	
Pecos:	N ..	2	3	58	45	51	159
	% ..	1.44	2.16	41.73	32.37	22.30	
Females:	N ..	1	0	3	1	0	5
	% ..	20.00	0.00	60.00	20.00	0.00	
Pecos:	N ..	20	1	29	29	4	92
	% ..	51.52	1.09	31.52	31.52	4.35	

Sagittal Region. The absence of male crania which are narrow in the sagittal region is to be laid at the door of deformation. In spite of this, one-third of the small group of females are narrow; on the whole they are narrower than their Pecos sisters.

Both sexes from Mimbres exhibit greater elevation along the suture. A majority of males reveal a slight degree of depression

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posterior to the coronoid suture. The feature is not detectable in a quarter of them. The females reverse the usual order of having less than the masculine development of the character: 50 per cent display a medium depression, while only 1, or 17 per cent lacks it entirely. This must be partly freakish, and due to the small size of the group.

The average distribution in the prominence of the bosses of the parietal bones is again an effect of deformation; we should hardly expect an undeformed sample of these small-headed people to attain a European standard.

BREADTH OF SAGITTAL REGION

		Submedium	Medium	Pronounced	Total
Females:	N	0	11	4	15
	%	0.00	73.33	26.67	
Pecos:	N	22	69	47	138
	%	15.94	50.00	34.06	
Females:	N	2	4	0	6
	%	33.33	66.67	0.00	
Pecos:	N	2	53	43	98
	%	2.04	54.08	43.88	

ELEVATION OF THE SAGITTAL REGION

		Absent	Submedium	Medium	Pronounced	Total
Males:	N	5	8	6	1	15
	%	33.33	20.00	40.00	6.67	
Pecos:	N	57	63	16	0	136
	%	41.90	47.10	11.59	0.00	
Females:	N	1	2	1	1	5
	%	20.00	40.00	20.00	20.00	
Pecos:	N	29	57	12	0	98
	%	29.59	58.16	12.24	0.00	

POSTCORONOID DEPRESSION

		Absent	Submedium	Medium	Pronounced	Total
Males:	N	4	8	2	0	14
	%	28.57	57.14	14.29	0.00	
Pecos:	N	57	51	15	15	138
	%	41.30	36.96	10.87	10.87	
Females:	N	1	2	3	0	6
	%	16.67	33.33	50.00	0.00	
Pecos:	N	63	29	5	1	98
	%	64.29	29.59	5.10	1.02	

PROMINENCE OF PARIETAL BOSSES

		Submedium	Medium	Pronounced	Total
Males	N	3	9	3	15
	%	20.00	60.00	20.00	
Females:	N	3	3	0	6
	%	50.00	50.00	0.00	

Temporal Region. The apparently greater fullness of the Mimbres crania over the Pecos in the temporal region is due probably to deformation and perhaps partly to a difference in the observer's judgment. Sex differences are distinguishable in neither series.

Certainly the personal equation appears in the observation of supramastoid crests. As is to be expected, the males exhibit on the whole a greater development of this feature.

The mastoid processes fall into a normal distribution as to size. In both sexes the mode is a medium size. Outside of this, male processes tend to be large, female to be small. Both sexes, moreover, appear to have larger processes on the average than the corresponding Pecos series.

The males show a somewhat more pronounced definition, from the forehead back, of that temporal crest which marks the margin of the fan-like spread of the temporal muscles.

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FULLNESS OF TEMPORAL REGION

		Compressed	Submedium	Medium	Bulging	Sphenoid Depression	Total
Males:	N	0	0	9	5	0	14
	%	0.00	0.00	64.29	35.71	0.00	
Pecos:	N	29	25	45	32	5	135
	%	21.48	19.26	33.33	23.70	2.22	
Females:	N	0	0	4	2	0	6
	%	0.00	0.00	66.67	33.33	0.00	
Pecos:	N	22	18	35	18	5	98
	%	22.45	18.37	35.71	18.37	5.10	

SUPRAMASTOID CRESTS

		Absent	Submedium	Medium	Pronounced	Total
Males:	N	0	2	9	4	15
	%	0.00	13.33	60.00	26.67	
Pecos:	N	115	12	10	3	140
	%	82.14	8.57	7.14	2.14	
Females:	N	0	3	2	1	6
	%	0.00	50.00	33.33	16.67	
Pecos:	N	91	9	3	0	103
	%	88.35	8.74	2.91	0.00	

SIZE OF MASTOIDS

		Small	Medium	Large	Very large	Total
Males:	N	2	9	4	0	15
	%	13.33	60.00	26.67	0.00	
Pecos:	N	40	59	30	6	141
	%	32.62	41.84	21.27	4.25	
Females:	N	2	3	1	0	6
	%	33.33	50.00	16.67	0.00	
Pecos:	N	70	19	10	0	99
	%	70.71	19.19	10.10	0.00	

TEMPORAL CRESTS

		Submedium	Medium	Pronounced	Total
Males:	N	4	7	2	13
	%	30.77	53.85	15.38	
Females:	N	2	3	0	5
	%	40.00	60.00	0.00	

Occipital Region. The majority of occipital tori in male crania are small, and in 50 per cent of the female crania they are absent. However, tori are absent in a smaller percentage of Mimbres skulls than of Pecos. As there are undeformed crania among the latter and not among the former, this fact may bear out a suggestion of Dr. Hooton's that occipital deformation throws the skull off balance and that the need of an adaption to provide for insertion of the nuchal muscles may give rise to a torus.

The slope of the occiput, whether flat or protruding, cannot well be compared to the Pecos series, as slightly different categories were adopted.

The most protruding occiputs attain only to a medium convexity. There is nothing to choose between sexes.

OCCIPITAL TORUS

		Absent	Small	Medium	Large	Total
Males:	N	2	8	3	0	13
	%	15.38	61.54	23.08	0.00	
Pecos:	N	55	44	21	18	138
	%	39.86	31.88	15.21	13.04	
Females:	N	3	3	0	0	6
	%	50.00	50.00	0.00	0.00	
Pecos:	N	38	42	11	6	97
	%	39.18	43.20	11.34	6.19	

SLOPE OF OCCIPITAL REGION

		Vertical	Steep	Medium Convex	Total
Males:	N	1	6	6	13
	%	7.69	46.15	46.15	
Females:	N	0	4	2	6
	%	0.00	66.67	33.33	

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Sutures. The males, as is usual, have more involved sutures than the females. The Mimbres males have fewer simple, and more complicated, sutures than those from Pecos.

SERRATION OF SUTURES

		Simple	Medium	Complex	Total
Males:	N	3	9	0	12
	%	25.00	75.00	0.00	
Pecos:	N	106	26	5	137
	%	77.37	18.98	3.65	
Females:	N	3	2	0	5
	%	60.00	40.00	0.00	
Pecos:	N	84	12	0	96
	%	87.50	12.50	0.00	

OCCLUSION OF SUTURES

		Males	Pecos	Females	Pecos
Coronal open					
Sagittal open	N	1	...	1	...
Lambdoid open	%	7.14	33.57	25.00	33.00
Coronal beginning					
Sagittal open	N	3	...	1	...
Lambdoid open	%	21.43	7.14	25.00	25.00
Coronal open					
Sagittal beginning	N	1	...	0	...
Lambdoid open	%	7.14	5.00	0.00	1.00
Coronal beginning					
Sagittal beginning	N	2	...	1	...
Lambdoid open	%	14.29	6.43	25.00	12.00
Coronal obliterated					
Sagittal obliterated	N	1	...	0	...
Lambdoid beginning	%	7.14	1.43	0.00	2.00
Coronal obliterated					
Sagittal obliterated	N	6	...	1	...
Lambdoid obliterated	%	42.86	2.14	25.00	4.00
Total	.....	14	...	4	...

As to the closing of the sutures, there are so many possible combinations, and the series is so small, that little information is to be gleaned. In a large percentage of cases, all sutures are obliterated

due to age. Outside of this, the most common observation is that occlusion has begun in the coronal suture, or that it has begun in both coronal and sagittal sutures. This leads one to the belief that the order of occlusion is coronal, sagittal, and lambdoid; in fact, there is only one case in which this order is contradicted. In the

OCCURRENCE OF WORMIAN BONES

		Absent	Present	Doubtful	Total
Males:	N	1	8	4	13
	%	7.69	61.54	30.77	
Females:	N	2	3	1	6
	%	33.33	50.00	16.67	
		Males	Pecos	Females	Pecos
Absent	N	1	25	2	25
	%	11.11	17.86	40.00	22.94
Present	N	8	115	3	84
	%	88.89	82.14	60.00	77.06
Total	.....	9	140	5	109

LOCATION OF WORMIAN BONES

		Lambdoid	Temporo-parietal	Temporo-occipital	Inca Bones
Males:	N	8 out of 10	1 out of 9	0 out of 8	2 out of 10
	%	80.00	11.11	0.00	20.00
Pecos:	%	58.26	7.83	21.74	0.87
Females:	N	2 out of 5	1 out of 6	1 out of 6	0
	%	40.00	16.67	16.67	0.00
Pecos:	%	65.48	5.95	18.10	1.19

The Pecos percentages are calculated from occurrence in the total number of Wormian bones, not from occurrence in the series.

Pecos series, however, by the same method, the order is found to be: sagittal, coronal, and lambdoid.

Wormian bones occur even more frequently than at Pecos, being found in 80 per cent of male crania. In both series, the males manifest the character more often than the females. The lambdoid suture is by all odds the commonest location, and generally displays several. Two crania, or 20 per cent, have an Inca bone (in both cases bi-partite), while the whole male series from Pecos yields only one example, or 0.87 per cent.

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Pteria are, without exception, in the form of a K, while H-forms predominate at Pecos.

FORM OF PTERION

	Males	Pecos	Females	Pecos
K-form: N	10	...	5	...
%	100.00	16.15	100.00	23.08

Parietal Foramina. In both series females lack parietal foramina more often than males. Two medium foramina is the most common type among the Mimbres males, while one or two small are the dominant variations at Pecos.

PARIETAL FORAMINA

		Males	Pecos	Females	Pecos
None:	N	3	...	2	...
	%	23.08	14.72	33.33	18.92
One small:	N	2	...	1	...
	%	15.38	23.24	16.67	21.62
One medium:	N	1	...	2	...
	%	7.69	13.47	33.33	6.31
Two small:	N	1	...	0	...
	%	7.69	25.35	0.00	21.62
Two medium:	N	5	...	0	...
	%	38.46	7.74	0.00	4.50
One large:	N	1	...	1	...
	%	7.69	1.42	16.67	1.80
Total		13	...	6	...

Orbits. In the table dealing with shape, the orbits which might be called "oblong" have been subdivided in the present series according to whether the upper and lower margins are parallel, or diverge exteriorly. A small minority of orbits from Pecos occupies such categories as "round" or "oval," which are not represented in the Mimbres series.

A medium inclination is displayed by the majority of both sexes. Of the two pueblos, a considerably greater degree of inclination rules among the Mimbres crania. This is partly to be expected when we consider that the measurements reveal orbits of equal

breadth which are set, in Mimbres crania, in somewhat narrower faces.

Infra-orbital sutures occur more frequently in Mimbres than in Pecos crania, and probably more often among females than males.

The suborbital fossa among the Mimbres skulls reveals a greater accent on a medium depth than among Pecos crania, where medium and deep fossae are equally common.

SHAPE OF ORBITS

		Square	Parallelo-gram	Oblique Rhomboid	Oblong	Total crania
Males:	N	4	6	4	...	14
	%	28.57	42.86	28.57	...	...
Pecos:	N	41	...	...	82	130
	%	31.54	...	...	63.08	...
Females:	N	1	2	2	...	5
	%	20.00	40.00	40.00	...	...
Pecos:	N	39	...	...	52	96
	%	40.63	...	...	54.17	...

INCLINATION OF ORBITS

		Absent	Submedium	Medium	Pronounced	Total
Males:	N	1	1	9	3	14
	%	7.14	7.14	64.29	21.43	...
Pecos:	N	35	32	44	19	130
	%	26.92	24.62	33.85	14.62	...
Females:	N	0	2	3	0	5
	%	0.00	40.00	60.00	0.00	...
Pecos:	N	48	25	17	6	96
	%	50.00	26.04	17.71	6.25	...

INFRAORBITAL SUTURE

		Males	Pecos	Females	Pecos
Absent:	N	5	77	0	46
	%	35.46	65.25	0.00	48.94
Present:	N	8	41	6	48
	%	61.54	34.75	100.00	51.06
Total	...	13	118	6	94

SUBORBITAL FOSSAE

		Absent	Shallow	Medium	Deep	Total
Males:	N	0	5	9	3	17
	%	0.00	29.41	52.94	17.65	
Pecos:	N	3	84	50	42	129
	%	2.30	26.36	38.74	32.56	
Females:	N	0	1	6	1	8
	%	0.00	12.50	75.00	12.50	
Pecos:	N	1	23	36	35	95
	%	1.05	24.21	37.89	36.84	

Malars. Between the series there is a striking difference in the size of the malar bones: 81 per cent of Mimbres malars are medium in size, while almost 60 per cent of Pecos malars are large. The females are all medium.

The same difference is found in the size of the zygomatic arches, those from Mimbres being almost totally of a medium size, while a majority of Pecos zygomata are large.

Marginal processes are very much more common at Mimbres.

SIZE OF MALARS

		Small	Medium	Large	Very Large	Total
Males:	N	0	13	3	0	16
	%	0.00	81.25	18.75	0.00	
Pecos:	N	4	42	78	11	135
	%	0.75	31.82	59.09	8.33	
Females:	N	0	6	0	0	6
	%	0.00	100.00	0.00	0.00	
Pecos:	N	8	61	25	0	94
	%	8.51	64.89	26.60	0.00	

PRESENCE OF MARGINAL PROCESSES

		Males	Pecos	Females	Pecos
Present:	N	8	13	4	5
	%	50.00	9.16	66.67	4.63
Total	.....	16	142	6	108

ZYGOMATA

		Small	Medium	Large	Very Large	Total
Males:	N	0	9	1	0	10
	%	0.00	90.00	10.00	0.00	
Pecos:	N	3	39	65	14	121
	%	2.48	32.23	53.72	11.57	
Females:	N	1	3	0	0	4
	%	25.00	75.00	0.00	0.00	
Pecos:	N	12	57	22	0	91
	%	13.19	62.64	24.18	0.00	

Nose. A nasion depression is considerably more common and more developed among the male crania than in the Pecos series; here should be taken into consideration the larger brow ridges of the Mimbres skulls. The females, characteristically, lack the depression entirely.

The Mimbres series seems to have considerably higher nasal bridges. Probably there is a personal difference in observation. There is little difference in the breadth of the nasal bridge, except that there are fewer narrow noses from Mimbres.

The predominant shape for the downward slope of the nasal bones is concavo-convex, a double curve. This is true of both sexes in both series. The Mimbres males also exhibit a large percentage of concave noses.

The breadth of the aperture is judged to be medium in a large majority of both sexes and series. However, in the Mimbres crania, the usual sex difference is reversed, the females lacking broad apertures, and the males lacking narrow ones.

Mimbres crania have, in the majority, a medium definition of the lower borders of the nasal aperture, while in the Pecos crania these are mainly indistinctly defined. From 10 per cent to 20 per cent in both series have a sharp border, and the sill is entirely lacking in only one or two of the Pecos crania.

The nasal spine is more highly developed in the females; this is contrary to the ordinary tendency. Both sexes, especially the females, give a higher percentage of medium spines.

A subnasal groove is present in only 10 per cent or 12 per cent in both sexes of both series.

DEPRESSION OF NASAL ROOT

		Absent	Submedium	Medium	Pronounced	Total
Males:	N	4	6	4	1	15
	%	26.67	40.00	26.67	6.67	
Pecos:	N	85	44	3	2	134
	%	63.43	32.83	2.24	1.49	
Females:	N	5	0	0	0	5
	%	100.00	0.00	0.00	0.00	
Pecos:	N	98	5	0	0	103
	%	95.15	4.85	0.00	0.00	

HEIGHT OF NASAL BRIDGE

		Submedium	Medium	Pronounced	Total
Males:	N	2	10	3	15
	%	13.33	66.67	20.00	
Pecos:	N	81	40	5	126
	%	64.29	31.75	3.97	
Females:	N	1	3	1	5
	%	20.00	60.00	20.00	
Pecos:	N	94	6	1	101
	%	93.07	5.94	0.99	

BREADTH OF NASAL BRIDGE

		Submedium	Medium	Pronounced	Total
Males:	N	2	12	1	15
	%	13.33	80.00	6.67	
Pecos:	N	42	73	11	126
	%	33.33	57.94	8.73	
Females:	N	0	5	0	5
	%	0.00	100.00	0.00	
Pecos:	N	22	64	15	101
	%	21.78	63.37	14.85	

SLOPE OF NASAL BRIDGE

		Straight	Concave	Convex	Concavo-Convex	(%)	Total
Males:	N	1	4	3	5	...	13
	%	7.69	30.77	23.08	38.46	...	
Pecos:	N	20	13	11	64	18	126
	%	15.87	10.32	8.73	50.79	14.29	
Females:	N	1	0	2	2	...	5
	%	20.00	0.00	40.00	40.00	...	
Pecos:	N	14	16	8	41	22	101
	%	13.86	15.84	7.92	40.59	21.78	

BREADTH OF NASAL APERTURE

		Narrow	Medium	Broad	Total
Males:	N	0	14	1	15
	%	0.00	93.33	6.67	
Pecos:	N	12	84	36	132
	%	9.09	63.64	27.27	
Females:	N	2	5	0	7
	%	28.57	71.43	0.00	
Pecos:	N	6	59	37	102
	%	5.88	57.84	36.27	

LOWER BORDERS OF NASAL APERTURE

		Sharp	Medium	Indistinct	Almond	Total
Males:	N	2	9	3	0	14
	%	14.29	64.29	21.43	0.00	
Pecos:	N	14	35	83	2	134
	%	10.45	26.12	61.94	1.49	
Females:	N	2	5	3	0	10
	%	20.00	50.00	30.00	0.00	
Pecos:	N	10	53	58	3	103
	%	9.71	51.07	56.31	2.91	

NASAL SPINE

		Submedium	Medium	Pronounced	Total
Males:	N	4	10	1	15
	%	26.67	66.67	6.67	
Pecos:	N	58	59	14	131
	%	44.27	45.04	10.69	
Females:	N	1	7	0	8
	%	12.50	87.50	0.00	
Pecos:	N	62	29	8	99
	%	62.63	29.29	8.08	

SUBNASAL GROOVES

		Absent	(Doubtful)	Indication	Submedium	Medium	Total
Males:	N	14	0	0	1	1	16
	%	87.50	0.00	0.00	6.25	6.25	
Pecos:	N	114	11	4	10	3	142
	%	80.28	7.74	2.81	7.04	2.10	
Females:	N	8	0	0	0	1	9
	%	88.89	0.00	0.00	0.00	11.11	
Pecos:	N	98	6	1	4	0	109
	%	89.91	5.50	0.91	3.67	0.00	

Alveolar Prognathism. It is surprising that both sexes from Mimbres reveal a somewhat smaller amount than Pecos crania of observed prognathism, while the gnathic index showed the former to be definitely more prognathous. Prognathism is estimated by

ALVEOLAR PROGNATHISM

		Absent	Submedium	Medium	Pronounced	Very Pronounced	Total
Males:	N	1	2	7	1	1	12
	%	8.33	16.67	58.33	8.33	8.33	
Pecos:	N	0	32	59	27	1	119
	%	0.00	26.89	49.58	22.69	0.84	
Females:	N	0	1	3	1	0	5
	%	0.00	20.00	60.00	20.00	0.00	
Pecos:	N	0	13	32	44	6	95
	%	0.00	13.68	33.68	46.32	6.32	

holding the skull in the eye-ear plane and observing how much the alveolar process protrudes forward of a vertical line through the nasion. Doubtless in this case the personal standards of the observers differ. There is also to be considered the fact that the brow-ridges in our series are large. Projection of low brow ridges tends to mask prognathism.

Palate. The tendency in shape is very strongly toward parabolic palates; more pronouncedly so than in the case of the Pecos crania. There are a few elliptical or U-shaped palates.

As to height, all the crania are divided evenly between medium and high palates. The Mimbres males alone display distinctly fewer high palates.

There is only one palatine torus in the Mimbres series, and tori are correspondingly rare from Pecos. One only from Pecos attains a medium development; all the rest are small.

SHAPE OF PALATE

		Parabolic	Elliptical	U-shaped	Hyperbolic	Total
Males:	N	12	2	1	0	15
	%	80.00	13.33	6.67	0.00	
Pecos:	N	58	4	29	11	102
	%	56.86	3.92	28.43	10.78	
Females:	N	9	0	1	0	10
	%	90.00	0.00	10.00	0.00	
Pecos:	N	40	5	26	2	73
	%	54.79	6.85	35.62	2.74	

HEIGHT OF PALATE

		Submedium	Medium	Pronounced	Total
Males:	N	0	11	4	15
	%	0.00	73.33	26.67	
Pecos:	N	2	46	54	102
	%	1.96	45.10	52.94	
Females:	N	0	5	5	10
	%	0.00	50.00	50.00	
Pecos:	N	4	37	32	73
	%	5.48	50.68	43.84	

PALATINE TORUS

	Males	Pecos	Females	Pecos
Present: N	1	17	0	15
%	0.67	11.97	0.00	18.51
Total	15	142	10	111

The degree of development is submedium in all cases except that of one Pecos female, in which it is medium.

Cranial Base. The glenoid fossa gives a high percentage of medium depth in both sexes; there is an additional accent on deep fossae in males and shallow ones in females. This is usual, and the rule is followed in the Pecos series, but here the medium category is not quite so dominating. The postglenoid process is absent in a majority of cases, but is present more frequently in both Mimbres sexes than at Pecos. Arthritis at the glenoid fossa is observable in 1 Mimbres male, or 7 per cent; it also occurs in 4 per cent of Pecos males and 9 per cent of Pecos females.

Little can be told concerning holes in the floor of the auditory meatus, or concerning retro-mastoid foramina. Regarding the latter, 2 or more is the usual case, and there may be as many as 6 or 8.

The prevalent form of the foramen magnum is one that is easily resolved into a hexagon.

Postcondyloid foramina are often of different sizes, and one or both are sometimes absent. In this instance the most common form is 2 of medium size.

Depression of the petrous parts of the temporal bones below the basilar process of the occiput corresponds to raising of the basilar process, affording more room at this point for the brain, and is a superior character. In both series a slight depression rules, and in the Mimbres females it is entirely absent in 83 per cent.

Middle lacerate foramina, though apt to show a correlation with depression of the petrous parts, are in this case evenly distributed, with a medium size as the mode, in both sexes. The pronounced discrepancy in the Pecos distribution is probably due to different standards in observation. This may also apply in part to the observations on the posterior lacerate foramina, in which the Pecos crania are revealed as having a large percentage of small foramina,

though both series give a majority of a medium size. (The Pecos crania exhibit other variations of this feature which are not recorded here.)

There is no example in the Mimbres series of a completed pterygospinous foramen. There are a number of variations in which this character may appear, but the percentage in which it is entirely absent is fairly constant for all four groups.

DEPTH OF GLENOID FOSSAE

		Shallow	Medium	Deep	Total
Males:	N	1	19	3	14
	%	7.14	71.43	21.43	
Pecos:	N	21	67	49	137
	%	15.32	48.90	35.77	
Females:	N	2	3	0	5
	%	40.00	60.00	0.00	
Pecos:	N	30	50	22	102
	%	29.41	49.02	21.57	

POSTGLENOID PROCESS

		Absent	Submedium	Medium	Pronounced	Total
Males:	N	8	1	5	0	14
	%	57.14	7.14	35.71	0.00	
Pecos:	N	103	24	7	5	137
	%	75.32	17.53	5.11	2.19	
Females:	N	3	1	1	0	5
	%	60.00	20.00	20.00	0.00	
Pecos:	N	92	9	1	0	102
	%	90.20	8.82	0.98	0.00	

DEHISCENCES IN FLOOR OF AUDITORY MEATUS

		Males	Pecos	Females	Pecos
Present:	N	2	23	1	27
	%	22.22	16.20	16.67	24.32
Doubtful:	N	0	12	0	9
	%	0.00	8.45	0.00	8.11
Absent:	N	7	107	5	75
	%	77.78	75.35	83.33	67.57
Total	9	142	6	111

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RETRO-MASTOID FORAMINA

		None	One	Two or More	Total
Males:	N	0	2	7	9
	%	0.00	22.22	77.78	
Pecos:	N	7	12	97	116
	%	6.03	10.34	83.62	
Females:	N	0	1	3	4
	%	0.00	25.00	75.00	
Pecos:	N	4	7	64	75
	%	5.33	9.33	85.33	

SHAPE OF FORAMEN MAGNUM

		Half Diamond	Oval	Pentagonal	Hexagonal	Total
Males:	N	0	2	1	5	8
	%	0.00	25.00	12.50	62.50	
Pecos:	N	11	29	3	33	(98)
	%	11.22	29.59	3.06	33.67	
Females:	N	1	0	1	4	6
	%	16.67	0.00	16.67	66.67	
Pecos:	N	10	21	2	24	(75)
	%	13.33	28.00	2.67	32.00	

POSTCONDYLOID FORAMINA

		Males	Pecos	Females	Pecos
None:	N	1	1	0	4
	%	14.29	0.71	0.00	3.00
Small:	N	0	12	1	14
	%	0.00	8.51	16.67	12.61
Medium:	N	3	37	3	27
	%	42.86	26.14	50.00	24.32
Large:	N	1	17	0	0
	%	14.29	12.06	0.00	0.00
One absent, one medium:	N	1	4	0	2
	%	14.29	2.84	0.00	1.80
One absent, one large:	N	0	0	1	3
	%	0.00	0.00	16.67	4.50
One small, one medium:	N	0	7	1	4
	%	0.00	4.96	16.67	3.60
One small, one large:	N	1	6	0	3
	%	14.29	4.28	0.00	4.50
Total		7	(131)	6	(111)

DEPRESSION OF PETROUS PARTS OF TEMPORAL BONE

		Almost	Slight	Medium	Total
Males:	N	2	4	1	7
	%	28.57	57.14	14.29	
Pecos:	N	22	32	20	104
	%	21.15	50.00	28.85	
Females:	N	5	1	0	6
	%	83.33	16.67	0.00	
Pecos:	N	20	40	16	76
	%	26.32	52.63	21.05	

MIDDLE LACERATE FORAMINA

		Small	Medium	Large	Total
Males:	N	2	3	2	7
	%	28.57	42.86	28.57	
Pecos:	N	65	35	1	101
	%	64.36	34.65	0.99	
Females:	N	1	3	1	5
	%	20.00	60.00	20.00	
Pecos:	N	54	19	0	73
	%	73.97	26.03	0.00	

POSTERIOR LACERATE FORAMINA

		Males	Pecos	Females	Pecos
Both small:	N	0	37	1	28
	%	0.00	36.27	16.67	37.33
Both medium:	N	7	46	3	37
	%	87.50	45.10	50.00	49.33
One small, one medium:	N	1	5	1	5
	%	12.50	4.90	16.67	6.67
One small, one large	N	0	5	1	1
	%	0.00	4.90	16.67	1.33
Total		8	(102)	6	(75)

PTERYGO-SPINOUS FORAMINA

		Males	Pecos	Females	Pecos
Absent:	N	7	81	3	70
	%	77.78	71.05	60.00	76.92
Indicated, both sides:	N	2	15	2	8
	%	22.22	13.16	40.00	8.79
Total		9	(114)	5	(91)

Mandible. There are no small mandibles of either sex. Compared to the Pecos series, there is about the same percentage of large, but more of medium, size among the males. The females are all medium.

The mental process shows an even distribution in size. The amount of projection which it exhibits is judged from the alveolar process: a slight projection is more common among the Mimbres

SIZE OF MANDIBLE

		Small	Medium	Large	Total
Males:	N	0	12	7	19
	%	0.00	63.16	36.84	
Pecos:	N	20	70	44	134
	%	14.93	52.24	32.84	
Females:	N	0	9	0	9
	%	0.00	100.00	0.00	
Pecos:	N	33	46	18	97
	%	34.02	47.42	18.56	

males than among the Pecos males, but there is little difference between sexes; ordinarily, females project less. Here, the percentages for Mimbres males fit closely those for Pecos females. The ossification of the mental process, whether from one or two ossicles, displays the usual sex difference, males having bilateral and females median ossification in about two-thirds of the cases.

The sigmoid notch is shallower in the Mimbres males than in the females or the Pecos males.

The inferior-dental foramen is found above the level of the molar

crowns more often in Mimbres mandibles of both sexes than in Pecos mandibles.

A medium development is usual in the mylo-hyoid ridge; more so than at Pecos. The females lack examples of a submedium degree, which puts their development of this feature as a whole above that of the Pecos females.

Whereas small genial tubercles are prevalent in both Pecos sexes, medium tubercles show a large majority in the Mimbres crania.

SIZE OF MENTAL PROCESS

		Small	Medium	Large	Total
Males:	N	3	13	3	19
	%	15.79	68.42	15.79	
Females:	N	0	0	1	7
	%	0.00	85.71	14.29	

PROJECTION OF MENTAL PROCESS

		Absent	Small	Medium	Large	Total
Males:	N	1	7	10	1	19
	%	5.26	36.84	52.63	5.26	
Pecos:	N	2	25	67	39	133
	%	1.50	18.79	50.37	29.32	
Females:	N	0	3	3	1	7
	%	0.00	42.86	42.86	14.29	
Pecos:	N	2	32	53	8	95
	%	2.10	33.68	55.79	8.42	

OSSIFICATION OF MENTAL PROCESS

		Median	Bilateral	Total
Males:	N	7	13	20
	%	35.00	65.00	
Females:	N	4	2	6
	%	66.67	33.33	

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DEPTH OF SIGMOID NOTCH

		Submedium	Medium	Pronounced	Total
Males:	N	6	9	0	15
	%	40.00	60.00	0.00	
Pecos:	N	26	63	41	130
	%	20.00	48.46	31.54	
Females:	N	1	6	1	8
	%	12.50	75.00	12.50	
Pecos:	N	27	51	13	91
	%	29.67	56.04	14.29	

LEVEL OF INFERIOR DENTAL FORAMEN

		Low	Medium	High	Very High	Total
Males:	N	2	13	2	1	18
	%	11.11	72.22	11.11	5.56	
Pecos:	N	17	106	8	0	131
	%	12.98	80.92	6.11	0.00	
Females:	N	1	4	3	0	8
	%	12.50	50.00	37.50	0.00	
Pecos:	N	7	82	4	0	93
	%	7.53	88.17	4.30	0.00	

DEVELOPMENT OF MYLO-HYOID RIDGE

		Submedium	Medium	Pronounced	Total
Males:	N	4	15	1	20
	%	20.00	75.00	5.00	
Pecos:	N	50	61	19	131
	%	38.17	46.56	14.50	
Females:	N	0	7	1	8
	%	0.00	87.50	12.50	
Pecos:	N	41	44	11	97
	%	42.27	45.36	11.34	

GENIAL TUBERCLES

		Absent	Small	Medium	Large	Total
Males:	N	0	3	14	2	19
	%	0.00	15.79	73.68	10.53	
Pecos:	N	4	82	44	3	133
	%	3.01	61.66	33.08	2.66	
Females:	N	0	2	3	0	7
	%	0.00	28.57	71.43	0.00	
Pecos:	N	1	69	24	2	96
	%	1.04	71.88	25.00	2.08	

Teeth. The state of eruption of the teeth does not diverge noticeably in either sex from that in the Pecos crania, beyond the fact that while there seem to be fewer cases of actual suppression of the third molars, the eruption of these is imperfect in a larger percentage.

Both sexes, though there is no sexual difference, show less wear of the teeth than the Pecos group. This may be due to an inherently tougher enamel, or it may be due to age selection in the preservation of skeletons. The latter factor may also have influenced the percentages relating to loss of teeth, though it is to be doubted that it is entirely responsible. It is interesting to remark that the women tend either to have retained all their teeth or to have lost four or more. It may be suggested that childbearing contributed to this state of affairs, especially as the following table reveals the fact that, aside from loss of teeth, females suffered distinctly less than males from dental troubles. The reliability of the percentages on loss of teeth, however, is affected by the inclusion of individuals represented only by either the upper or lower jaw, the number of teeth lost being doubled for reduction to a common denominator.

As noted above, the females are less disposed than the males to caries, pyorrhea, and abscesses, the latter being almost absent. The males have distinctly fewer abscesses, though slightly more caries, than are to be found among the Pecos teeth. Pyorrhea is apparently far more prevalent in both sexes, but this is a condition upon which the judgment of different observers is apt to vary.

Both males and females reveal a much stronger tendency toward

the full complement of molar cusps than does the Pecos series; the males more than the females, at least in regard to the upper molars.

Rotation and crowding are common. The tendency of the series is toward full-sized molars and well-formed, though not too large, teeth; abnormalities tend toward supernumerary teeth and cusps (Plate 236, a); the impression is, then, that though the palate is slightly larger than that of the Pecos mean, the mandible and face are smaller, and the teeth are taxed for room.

Shovel incisors are an interesting phenomenon, investigated and described by Dr. Aleš Hrdlička.¹ On the lingual surface of this type of incisor appear ridges of enamel on the lateral edges, and sometimes on the distal edge as well, making a triangular fossa on the central part of the surface; these ridges converge toward the base of the tooth. They generally meet, and at their juncture there sometimes occurs either a tuberosity, or a well-developed cusp protruding parallel to the tooth (Plate 236, b). In the hollow formed by the converging ridges there is often a fissure in the enamel, though Hrdlička has never noted decay at this point, nor is any to be found in the Mimbres teeth. Associated with shovel development, there may also be a vertical groove on the lingual surface. The whole complex is found mainly in the upper incisors, rarely in the lower ones.

Shovel incisors are not a degenerative characteristic; on the contrary, they are generally large, strong teeth, and seem to be the result of an exuberance of the enamel-forming potential of the individual. The anthropoids exhibit this feature to a marked degree. As to man, well-developed shovel incisors are found in a high percentage of Indians, Chinese, Japanese, and Hawaiians, or peoples of Mongoloid extraction, and in a very low percentage of Whites and Negroes. For Indians in general, Hrdlička gives these figures: medium degree 67 per cent, submedium degree 24 per cent, or 91 per cent in all.

It will be seen that the Mimbres series approximates this percentage. The Pecos series, though tabulated differently, seems to fall a little lower. A table of this character was also made of sub-adults of both sexes who had their permanent incisors, since the teeth of these were less worn and all, more generally, surviving. From 50 per cent to 65 per cent of males, females, and sub-adults have well-marked shovel incisors in the upper jaw, and in no case

¹ Hrdlička, 1920, *Shovel-shaped Teeth*.

in any group is it more than feebly distinguished in the lower jaw. The number of occurrences of a basal cusp I believe to be large, though I have no comparative figures.

Individual anomalies are described in the final list. The most noteworthy of these is shared by three children who still have their milk teeth. The lower median and lateral incisor, or the latter and the adjacent canine, are fused laterally along their entire lengths, both enamel and root, a groove marking the line of junction (Plate 236, c). I have not seen this phenomenon in other crania, though I have heard it reported in living persons.

The Mimbres population, then, reveals a striking assortment of dental abnormalities, sufficient to suggest that there was present in the genetical constitution of the group some factor of instability tending to produce such anomalies. Moreover, most of these anomalies and variations lean, not toward a degenerative condition, but, on the contrary, toward vigorous growth and over-development of the teeth. Taken all in all, the group seems to have had healthier teeth than the inhabitants of Pecos.

DENTITION

		Both Jaws	Complete One Jaw	Total	2d Molars Partly	2d Molars Absent	Total
Males:	N	10	9	19	2	1	22
	%	45.45	40.91	86.36	9.09	4.55	
Pecos:	N .....	...	...	128	2	12	142
	% .....	...	...	90.14	1.41	8.45	
Females:	N	2	11	13	2	0	15
	%	13.33	73.33	86.67	13.33	0.00	
Pecos:	N .....	...	...	101	3	4	108
	% .....	...	...	93.52	2.78	3.70	

WEAR OF TEETH

		Slight	Medium	Pronounced	Very Pronounced	Total
Males:	N	2	11	6	1	20
	%	10.00	55.53	30.00	5.00	
Pecos:	N	20	47	53	19	139
	%	14.39	33.81	41.01	15.67	
Females:	N	2	10	4	1	17
	%	11.76	58.82	23.53	5.88	
Pecos:	N	26	37	29	14	106
	%	24.53	34.91	27.36	13.21	

TEETH LOST IN LIFE

		None lost	1 to 3 32	4 and up 32	Total
Males:	N	9	7	4	20
	%	45.00	35.00	20.00	
Females:	N	7	1	6	14
	%	50.00	7.14	42.86	

QUALITY OF DENTITION

		Caries	Abscesses	Pyorrhea	Total cases
Males:	N ...	10 out of 18	6 out of 22	10 out of 22	...
	% ...	55.56	27.27	45.45	
Pecos:	N ...	65	72	5	142
	% ...	45.77	50.70	3.52	
Females:	N ...	6	1	5	15
	% ...	40.00	6.67	33.33	
Pecos:	N ...	55	41	3	111
	% ...	40.55	36.94	2.70	

CUSPS OF UPPER MOLARS

		Males	Pecos	Females	Pecos
4-4-4 (or 7-4-4):	N	7	8	3	4
	%	63.64	16.00	33.33	0.52
4-4-3:	N	4	16	2	13
	%	36.36	32.00	22.22	30.95
4-4-2:	N .....	...	...	1	2
	% .....	...	...	11.11	4.76
4-3-3 (or 7-3-3):	N .....	...	...	2	15
	% .....	...	...	22.22	35.71
4-3-2:	N .....	...	...	1	7
	% .....	...	...	11.11	16.67
Total	.....	11	(50)	9	(42)

CUSPS OF LOWER MOLARS

		5-3-5	5-3-0	5-4-5	Total
Males:	N	10	3	1	14
	%	71.43	21.43	7.14	
Pecos:	N	10	0	7	(47)
	%	21.28	0.00	14.89	

Females: In 4 completely and 5 partially observable cases, there are no lower molars with less than 5 cusps.

DENTAL ABNORMALITIES

		Males	Pecos	Females	Pecos
Supernumerary tooth:	N	1 out of 20	3	0	1
	%	5.00	2.11	0.00	0.90
Supernumerary cusp:	N	1 out of 13	...	0	...
	%	8.33	...	0.00	...
Rotation:	N	3 out of 15	8	2 out of 14	5
	%	20.00	5.63	14.29	4.30
Crowding:	N	6 out of 15	25	7 out of 14	20
	%	40.00	17.61	50.00	18.02
Total crania		142		111	

SHOVEL INCISORS

	Males		Females	
	N	%	N	%
Present, upper incisors	6 out of 7	85.71	6 out of 6	100.00
Degree, upper incisors				
Submedium	3	50.00	4	66.67
Medium	3	50.00	2	33.33
Present, lower incisors	1 out of 9	11.11	1 out of 3	33.33
Degree, lower incisors				
Submedium	1	100.00	1	100.00
Basal cusp, upper incisors	1	16.67	1	16.67
Groove on lingual surface, upper incisors	1	16.67	1	16.67

SHOVEL INCISORS

SUB-ADULTS, BOTH SEXES

		<i>Position</i>			<i>Total</i>
		<i>Absent</i>	<i>Upper incisors only</i>	<i>Upper and lower incisors</i>	
<i>N</i>	.....	1	5	4	10
<i>%</i>	.....	10.00	50.00	40.00	
		<i>Degree</i>			<i>Total</i>
		<i>Doubtful</i>	<i>Submedium</i>	<i>Medium</i>	
Upper incisors: <i>N</i>	.....	1	3	5	9
<i>%</i>	.....	11.11	33.33	55.56	
Lower incisors: <i>N</i>	.....	0	4	0	4
<i>%</i>	.....	0.00	100.00	0.00	
		<i>Basal Cusp, upper incisors</i>	<i>Groove on lingual surface, upper inc's.</i>	<i>Total Crania</i>	
Present: <i>N</i>	.....	2	2	9	
<i>%</i>	.....	22.22	22.22		

INDIVIDUAL ANOMALIES

Males

96498. Maleruption of right upper lateral incisor.

96501. Basal cusp on incisor. Two supernumerary teeth, in perfect alignment, in upper jaw between lateral incisors and canines. (See Plate 236.)

Females

96496. Supernumerary cusp external to second molar.

Sub-adults

96467. Child. Lower permanent incisors pointed, somewhat like a spearhead.

96468. Adolescent. Supernumerary tooth in incisive foramen.

96482. Child. Deciduous right lower left canine and lateral incisor fused together.

96500. Child. Deciduous lower left median and lateral incisors fused, root and crown. (See Plate 236.)

96503. Adolescent. Basal cusps on three upper incisors, central groove on the fourth. One of these cusps is larger than any illustrated by Hrdlička. (See Plate 236.)

96510. Child. Upper left second molar has a supernumerary cusp inferiorly.

96526. Child. Median and lateral incisors on both sides of mandible fused together along their whole length. Yellow discoloration in enamel of teeth.

CONCLUSIONS

The present group of crania is so small that it precludes subdivision for the purpose of refined analysis. At best we may only describe a general type and assign it a tentative disposition in the plotting of American racial types.

Comparative Tables. Below are given a number of tables of comparative figures for each measurement. The tables are paired; one deals with extra-American peoples and the other with various Indian groups, with the Pecos and Mimbres figures inserted in their proper order.

GLABELLO-OCCIPITAL LENGTH

South Australian ¹	191	San Francisco Bay ²	182.3
New Caledonia ³	188	Southern New England ⁴ ..	182.2
Tenerife ⁵	185.8	Madisonville ⁶	177.4
Mandingo ⁷	184	Pecos, undeformed	175.74
Mongol ⁸	184	North Pacific ⁹	175.6
Siwa ¹⁰	183.46	Peru ¹¹	175
Annamese ¹²	177	<i>Mimbres, corrected</i>	169.48
Tatar ¹³	176	Pecos, deformed	164.28
<i>Mimbres, corrected</i>	169.48	<i>Mimbres, deformed</i>	160.6
Arikara ¹⁴	162.8		

¹ Hrdlička, 1923, *Catalogue of Human Crania*.

² Quatrefages and Hamy, 1882, *Crania Ethnica*.

³ Hooton, 1925, *The Ancient Inhabitants of the Canary Islands*.

⁴ Hrdlička, 1924, *Catalogue of Human Crania*.

⁵ Ossis of Siwa; measured by writer.

⁶ Hrdlička, 1917, *Catalogue of Human Crania*.

⁷ Knight, 1915, *The Craniometry of Southern New England Indians*.

⁸ Hooton, 1920, *Indian Village Site and Cemetery near Madisonville, Ohio*.

⁹ Ottolenghi, 1930, *Craniology of the North Pacific Coast*.

MAXIMUM BREADTH

Mongol	150	Pecos, deformed	145.43
Annamese	143	Arikara	142.3
Tenerife	142.1	<i>Mimbres, deformed</i>	142.33
Tatar	142	North Pacific	140.8
<i>Mimbres, corrected</i>	140.04	San Francisco Bay	140.1
Siwa	135.71	<i>Mimbres, corrected</i>	140.04
Mandingo	134	Pecos, undeformed	137.84
South Australian	133	Peru	137
New Caledonia	131	Southern New England ..	134
Madisonville	146.1		

BASION-BREGMA HEIGHT

New Caledonia	140	<i>Mimbres, deformed</i>	141.83
Annamese	138	Pecos, deformed	140.69
Mandingo	136	Pecos, undeformed	137.14
<i>Mimbres, corrected</i>	135.10	Madisonville	136.9
Tenerife	131.9	San Francisco Bay	136.6
Mongol	131	<i>Mimbres, corrected</i>	135.10
South Australian	131	Arikara	134.6
Siwa	130.62	North Pacific	134.2
Tatar	129	Peru	131

CRANIAL MODULE

Mongol	155 ¹	Arikara	153.80 ¹
New Caledonia	153 ¹	San Francisco Bay	153 ¹
Tenerife	152.94	Southern New England ..	150.76 ¹
Annamese	152.67 ¹	Pecos, undeformed	150.48
South Australian	151.67 ¹	North Pacific	150.20 ¹
Mandingo	151.33 ¹	Madisonville	150.13 ¹
Siwa	149.93	Pecos, deformed	150.04
Tatar	149 ¹	<i>Mimbres</i>	145.86
<i>Mimbres</i>	148.89	Peru	147.67 ¹

¹ Calculated from means.

CRANIAL INDEX

<i>Mimbres, corrected</i>	82.63	Pecos, deformed	88.93
Mongol	81.4	<i>Mimbres, deformed</i>	87.45
Annamese	80.79	<i>Mimbres, corrected</i>	82.63
Tatar	80.68	Pecos, undeformed	78.30
Tenerife	76	Peru	78.28
Siwa	73.97	North Pacific	78
Mandingo	72.82	Arikara	77.9
South Australian	69.7	San Francisco Bay	76.8
New Caledonia	69.66	Southern New England ..	73.63

CRANIAL CAPACITY

Mongol	1753	Arikara	1485
Tenerife	1522 ¹	Madisonville	1435
Annamese	1320	San Francisco	1372
Mandingo	1460	Pecos	1367.94
New Caledonia	1445	Peru	1500
Tatar	1435	North Pacific	1549.5
<i>Mimbres</i>	1300 ¹	<i>Mimbres</i>	1300 ¹
South Australian	1285		

¹ Approximate: by formula.

BIZYGOMATIC DIAMETER

Mongol	142	Arikara	141.5
South Australian	135.6	Madisonville	141
New Caledonia	135	Pecos	138.56
<i>Mimbres</i>	133.60	North Pacific	138.5
Tatar	133	San Francisco Bay	136.7
Annamese	133	Peru	134
Tenerife	132	<i>Mimbres</i>	133.30
Mandingo	132	Southern New England ...	132
Siwa	124.48		

TOTAL FACIAL HEIGHT

Mongol	125.8	Arikara	122.1
<i>Mimbres</i>	116.43	Pecos	119.38
South Australian	114.5	San Francisco Bay	118.5
Tatar	92	Madisonville	117.9
New Caledonia	91	<i>Mimbres</i>	116.43
Mandingo	90	Southern New England ...	113.58
Annamese	89		

UPPER FACIAL HEIGHT

Mongol	77.6	North Pacific	75
<i>Mimbres</i>	71.60	San Francisco Bay	75
Tenerife	70	Pecos	72.85
South Australian	69.6	Madisonville	72
Siwa	68.81	<i>Mimbres</i>	71.60
Peru	60	Southern New England ...	69.2
Arikara	70		

TOTAL FACIAL INDEX

Mongol	85.8	Arikara	86.1
<i>Mimbres</i>	85.00	San Francisco Bay	85.7
South Australian	84.3	Pecos	85.69
Tatar	89.17	<i>Mimbres</i>	85.00
Mandingo	68.18	Southern New England ...	84.33
New Caledonia	67.40	Madisonville	83
Annamese	68.91		

NASAL LENGTH

Mongol	56	South Australian	48.5
Tatar	53	Arikara	55.6
Siwa	51	North Pacific	53.1
Tenerife	51	San Francisco Bay	51
Annamese	51	Pecos	50.96
New Caledonia	50.5	Southern New England ...	50.35
Mandingo	50	Peru	50
<i>Mimbres</i>	49.67	<i>Mimbres</i>	49.67

NASAL BREADTH

Mongol	27.5	Siwa	23.43
<i>Mimbres</i>	27.31	<i>Mimbres</i>	27.31
Mandingo	27	Arikara	26.2
South Australian	26.7	Pecos	25.90
New Caledonia	26.5	Southern New England ...	25.77
Annamese	26	North Pacific	24.7
Tatar	25	San Francisco Bay	24.6
Tenerife	24	Peru	24

NASAL INDEX

South Australian	55	<i>Mimbres</i>	50.42
Mandingo	54	Southern New England ...	52
New Caledonia	52.47	Madisonville	51.6
<i>Mimbres</i>	50.42	Pecos	50.44
Annamese	50.98	San Francisco Bay	48.2
Mongol	48.6	Peru	48.1
Tenerife	47.46	Arikara	47.1
Tatar	47.17	North Pacific	46.5
Siwa	45.94		

¹ Calculated from means.

PALATE LENGTH

New Caledonia	65	Siwa	52.69
South Australian	62.5	Annamese	52
Mandingo	60	<i>Mimbres</i>	55.92
Tatar	57	Pecos	55.04
<i>Mimbres</i>	55.92	North Pacific	53.7
Tenerife	53	Southern New England ...	53.96

PALATE BREADTH

South Australian	68.3	<i>Mimbres</i>	66.18
<i>Mimbres</i>	66.18	Pecos	65.59
Tenerife	64	North Pacific	65.4
Siwa	58.27	Southern New England ...	61.39

PALATAL INDEX

Tenerife	119.96	<i>Mimbres</i>	119.36
<i>Mimbres</i>	119.36	Pecos	119.10
Siwa	110.59	Madisonville	117.6
South Australian	109.3	Southern New England ...	115.94 ¹
North Pacific	122.4		

¹ Calculated from means.

Summary of Cranial Characteristics. The skull vault is decidedly small, even when the universal deformation is corrected. The length is below that of any group, but breadth and height are about medium. The cranial module, or the average of the three, is very low. However, I think it possible that this might rise slightly in undeformed skulls, as it is geometrically obvious that a given capacity is contained most economically, as to surface and diameters, in a body whose shape approaches most nearly that of a sphere. As to the cranial arcs, the horizontal circumference is particularly low.

The corrected indices show the series to be distinctly brachycephalic and hypsicephalic, though this apparent high-headedness is due more to the extreme shortness of the head than to any loftiness of the vault (this is with reference to the corrected means), albeit a majority exhibit a slight elevation along the sagittal suture. A post-coronoid depression is conspicuously frequent. The flat occiput and fairly bulging temporal region are the result of deformation.

My guess of 1300 cubic centimeters for the male cranial capacity, in which I have a good deal of faith, is extremely small.

The forehead is fairly narrow and receding. Supra-orbital ridges are medium to large, and generally of Type II.

The face is slightly below the Indian averages in dimensions (which are high for the world in general). The index is mesoprosopic. The malars and zygomata are not large nor very protruding, and the mandible is of medium depth.

The orbit is a little over medium size, with a marked inclination. The prevailing form is an oblique rhomboid.

The nose is platyrrhine, short and broad in absolute measurements, particularly for Indians. The aperture is generally piriform in shape. The root is somewhat depressed, but the bridge is high, and the shape of the bones is prevalently concavo-convex or concave.

The palate is large, particularly in the width, and principally parabolic in shape. Certainly it is distinctly large in proportion to the face.

Not a pronounced amount of alveolar prognathism was observed, though here individual skulls vary considerably. The gnathic index, however, on those which could be measured, showed them to be dis-

tinctly prognathous, as skulls with large palates and small faces might be expected to be.

The mandible is medium or large, but the chin eminence is not pronounced.

Variability. Of statistical interest is the fact that the standard deviations of Mimbres measurements are almost always lower than those of the same measurements on Pecos skulls. The average coefficient of variation (all coefficients of variation being theoretically comparable) of nineteen measurements on the male Mimbres crania is 4.82; that of the corresponding measurements on the Pecos crania is 5.86. Supposedly this indicates greater homogeneity among the Mimbres, and this may be to an extent true, but the very consistency with which the Mimbres standard deviations fall below the same Pecos constants, while at the same time they fail to fall low enough to make a significant difference, leads me to suspect that the joker lies in the mathematical imperfections of standard deviations *per se*; that is, that they are not sufficiently corrected, and in small series tend to be deceptively small.

Comparison with Pecos Morphological Types. An attempt may be made to elicit further evidence by comparing the Mimbres males to the Pecos "morphological cranial types." These were established by Dr. Hooton, who sorted and pored over his male crania for a number of days, and finally resolved the entire lot into eight types, to which he gave arbitrary names, each distinguished by certain characteristics, mainly facial. He thereupon proved the validity of accepting these types as the results of the partial segregation of various strains contributing to the population, by statistically comparing each type with the group as a whole, and with different series from all over the world which might, on the grounds of the original criteria, be supposed to have metrical affinities with the type. While this does not, and it was not intended to, bespeak a close relationship for any type with any people outside America, it shows that the Pecos type melts away into a number of what might be called "cranial patterns," or complexes of features, continually blending and re-segregating, each sub-type standing distinct from the others and from the whole. Only the "Residual" type, a catch-all for the "cranially undistinguished," and the "Large Hybrids," which Dr. Hooton describes as the idealized Indian cranial type and, though definitely by itself, as the result of the blending of all

the other types, fail to show significant variation from the whole group; and this applies to the Large Hybrid type only in the case of indices.

The special characteristics of the eight groups will not be gone into except in certain cases, with reference to the Mimbres crania. Two tables are herewith presented. The first of these deals only with the eight morphological groups, and lists the first, second, and third closest to the Mimbres series for twenty-nine measurements and nine indices. That is to say, for example, that the "Basket-makers" are closest to the Mimbres series in the mean of one measurement, second closest in the means of four, and so forth. The second table includes Total Series A (the original Pecos series) and Total Series B (the whole group of the eight types) for the purpose of seeing whether the Mimbres series would fall as close, if not closer, to these general inclusive groups, with reference to the subtypes, and so possibly demonstrating the random nature of seeming affinities between the Mimbres and particular types.

COMPARISON WITH PECOS MORPHOLOGICAL TYPES

TABLE 1								
	Measurements			Indices				
	1st	2nd	3rd	1st	2nd	3rd		
Basket-makers	1	4	6	0	1	1		
Pseudo-Negroids	7	5	2	1	1	0		
Pseudo-Australoids	1	5	6	1	1	3		
Plains Indians	3	4	4	0	2	0		
Long-faced Europeans	3	3	3	1	0	0		
Pseudo-Alpines	4	4	1	1	0	2		
Large Hybrids	1	5	3	4	1	0		
Residuals	0	0	3	1	5	3		
TABLE 2								
Total Series A	2	5	4	3	1	1		
Basket-makers	1	4	4	0	1	1		
Pseudo-Negroids	7	4	1	1	0	0		
Pseudo-Australoids	1	4	4	1	1	0		
Plains Indians	3	3	2	0	1	1		
Long-faced Europeans	2	2	2	0	1	0		
Pseudo-Alpines	2	4	3	1	0	1		
Large Hybrids	1	1	4	2	1	2		
Residuals	8	0	3	0	3	3		
Total Series B	2	2	2	1	0	0		

First, at least as far as measurements go, it is obvious that there is a fairly random distribution of proximity to various types. However, of the types, the Pseudo-Negroids and the Residuals seem certainly to be closer than any others, and remain so, even though Total Series A springs into third place in the second table.

The significance of this is, I think, mainly negative. It will be remembered that in practically all measurements the Mimbres skulls run slightly below those of Total Series A, though only seldom significantly so. The measurements of the Pseudo-Negroid group are likewise consistently lower than those of Total Series B; with respect to the larger diameters they are the lowest sub-group, and yield in this regard only to the Pseudo-Australoids in other measurements. The Residual type is the only one which does not differ significantly by measurements from Total Series B, but it also, in most diameters, is slightly below the average. Moreover, it is this type in which deformation is most prevalent. These remarks would seem to explain the larger number of proximities which these types display. The second table serves only to confirm the impression that the Mimbres means are very close to those of Total Series A, though, as ever, falling slightly lower.

When we turn to the indices, all impressions of a true affinity with the Pseudo-Negroid group are dispelled. The Large Hybrid and the Residual sub-groups are the only ones which fail to differ in respect to indices from Total Series B to a significant degree, and these are the two groups which rise above a general random distribution of proximity to the Mimbres indices and appear to be distinctly closer. (It must be admitted that both of these groups have a marked amount of deformation, like the Mimbres; however, the Pseudo-Alpines are still more deformed, but this does not bring them, in respect to indices, nearer than the other two types.) When we recall Dr. Hooton's remarks, given above, concerning these two groups, it is seen that the whole effect of the two tables is to demonstrate a considerably closer indicial correspondence with Total Series A than with any of the sub-groups, including the Residual group, which is not a true type but a trash-basket, and might also be expected to strike an average close to the whole.

Moreover, though most of the present crania are in a pretty well battered condition, one or two are not too far gone to allow their being put individually into one or the other of the Pecos groups. One is of the Basket-maker type, and another belongs with the

Large Hybrids. The implication carried by this is that a larger Mimbres sample would reveal the same distinct morphological types; strong evidence that the same constituents in both Mimbres and Pecos populations go to make up practically the same group type in both localities.

General Conclusions. What, then, has been revealed? Apparently, we have made a painfully detailed study of an insufficient sample. However, our method of tying this sample onto the apron strings of the Pecos series has been amply justified, for it brings order out of chaos.

First and most important, the two series, taken all in all, may be called identical physical groups. In view of their geographical proximity, there is no reason to doubt that they are two leaves on the same twig, let alone branch. The whole body of data, metric and observational, shows how consistently and how closely the one series approximates the other.

Second, there are a few plausible differences between the two, which should be met by some attempt at explanation. In the first place, there is an obvious tendency for the Mimbres crania to be a trifle smaller throughout. Some such difference as this I believe to be only a logical expectancy; too perfect a correspondence would be unnatural. This discrepancy might be due to a difference in diet, though the possibility of malnutrition is belied by the greater stature (?) of the Mimbrenos as well as by their better teeth. Moreover, although the Mimbres Valley was unoccupied at the arrival of the Spanish, it is not, according to Mr. and Mrs. Cosgrove, environmentally unfavorable. Again, though I am convinced that the two populations are fundamentally the same, it may be that the incursions of outsiders to which all pueblo-living peoples were subject, differed in amount and kind between the two villages. Or it is possible that the smaller heads, more platyrrhine noses, and more prognathous faces indicate a somewhat larger proportion of those strains, presumably the earlier ones, which are represented at Pecos by the Pseudo-Negroid and Pseudo-Australoid, and probably the Basket-maker types; for the present site is probably just prior in time to the establishment of Pecos.

However, of major differences and startling conclusions the cupboard is bare. It must suffice to have established, if only to my own satisfaction, the physical unity of at least two culture areas in the Southwest during the middle and latter part of the Pueblo period.

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a. The river at normal height



b. The river at flood stage (page 2)

THE MISSISSIPPI RIVER



a. View to the south from Skatts Ranch; Cooke Peak in background (page 2)



b. View to the east; ruin under excavation in center; struts on hill in left background (page 6)

THE MIMBRE VALLEY



a, Crops of corn and chili in the Mimbres Valley (page 3)



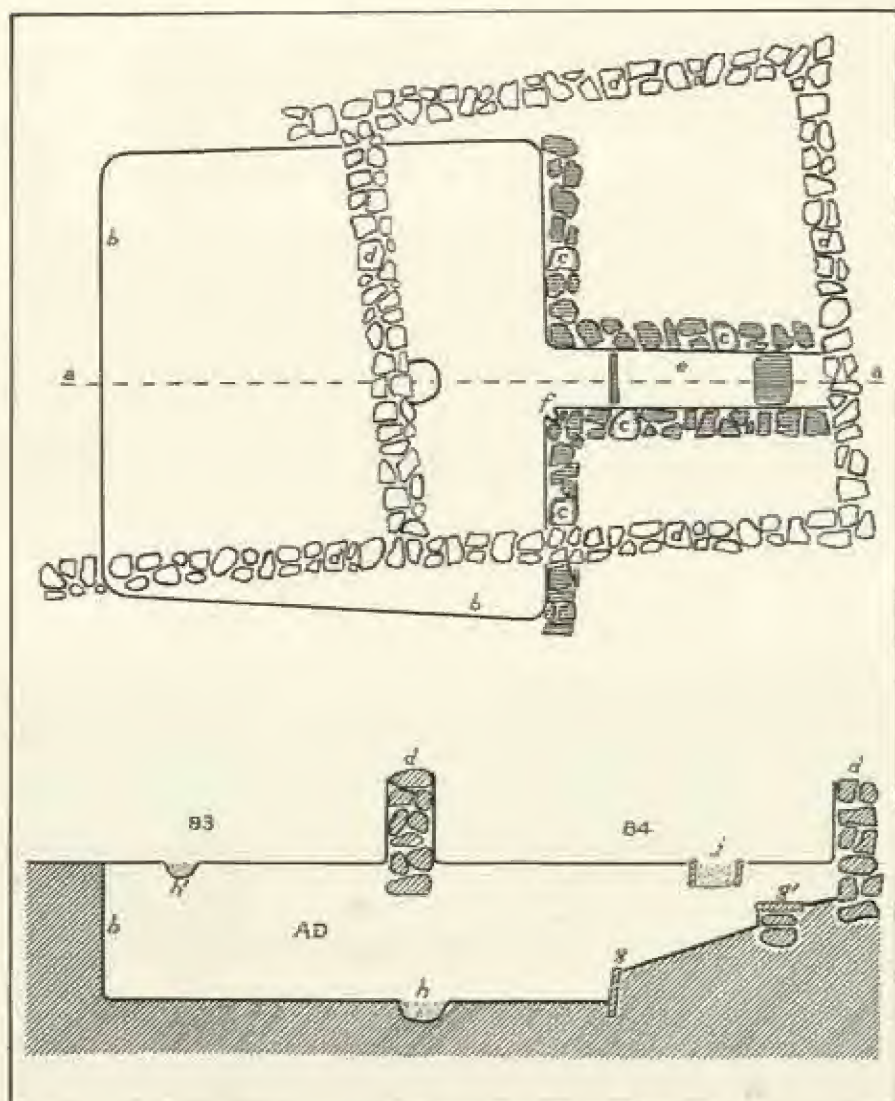
b, North end of Swarts mound before excavation (page 8)



a, Early Pit-room M. plastered north wall showing depth (page 9)



b, Transitional Pit-room A1) showing fire pit in floor, doorway opposite it in east wall, and incline with steps from door to ground level; at right, loose stones laid along the plaster-on-mud wall, the upper part of which was accidentally destroyed (pages 8 and 49)



PLAN AND SECTION OF TRANSITIONAL PIT-HOUSE AD

Room underlying Late Rooms 83 and 84: *a*, section through fire pit and entrance into Room AD; *b*, plaster-on-soil walls of Room AD; *c*, rubble walls of Room AD; *d*, rubble walls of Late Rooms 83 and 84; *e*, sloping passage to floor into Room AD; *f*, post mold in door casing; *g* and *g'*, steps in floor of sloping passage; *h*, fire pit in Room AD; *h'*, fire pit in Room 83; *j*, stone-curbed fireplace in Room 84 (page 9).



a. The room as it lay below the walls of Late houses



b. The Late walls removed showing two fireplaces and a stone-lined hole in the floor of AB
in line with the remains of an entrance in the east wall (page 9)

EARLY PIT-ROOM AB



4, Room H. Note outward pitch of the wall. Sub-floor air duct in Late Rooms 7-15 seen in the background. The fireplace and part of this duct were removed in clearing Room H which lay partly under Rooms 6 and 7-15 (page 12).



5, Door in east wall of Room T. Note post mold in one casing and fire pit in front of door (pages 11 and 49).

MIDDLE PERIOD ROOMS



a, Room Y lying below six Late rooms (page 12)



b, Room Y cleared, showing fireplace between doorway in east wall and adobe-lined pit. All but a lower course of south wall and part of east wall accidentally destroyed before room was discovered (page 41)

MOHAI PENION ROOM Y



a, Room 62, with objects as found on floor, also the charred stumps of four posts which supported the roof (page 15)



b, Some well plastered walls of Late rooms; Room 73 in foreground (page 17)

LATE ROOMS



a. Flagstone floor in store-room 36 (pages 17 and 49)



b. Room 65A with windows in party walls (page 18), double fireplace, and storage bins in the corner (page 10)

LATE ROOMS



a, Room 84 with connecting doorways and stone doors lying as found (pages 17 and 49); excavated rooms in background refilled with surplus dirt (page 31)



b, Room 100, doorway in party wall with stone door (pages 17 and 49); fireplace with a stone-lined box beside it (page 20)

DOORWAYS IN LATE ROOMS



a, Room 86 with double fireplace (pages 19 and 20) and opposite it at floor level, ventilator (page 15).
Example of good adobe floor (page 17)



b, Room 53, with bench (page 16) and trap-door cover (pages 17 and 46) in corner as found; fireplace (page 19) to adobe floor

VENTILATOR, BENCH, AND TRAP-DOOR COVER IN LATE ROOMS



a. Room B with stone-lined bin at left (page 19) and remains of curved fireplace, center foreground. The raised section of earth, right center, shows fire pit of previous occupation of the room



b. Close-up of double fireplace and storage bins in Room 68A (page 19)

FIREPLACES AND BINS IN LATE ROOMS



9, Fireplace with adobe curb and a stone-lined box, or oven, at the side in Room 18 (page 20)

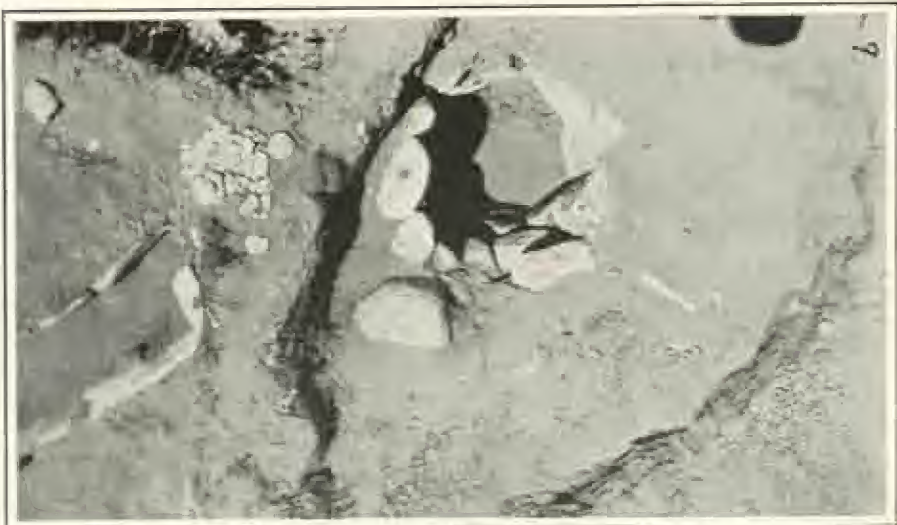


6, Stone platforms in Plaza 13. The one in the foreground is 6 feet in diameter (page 20)

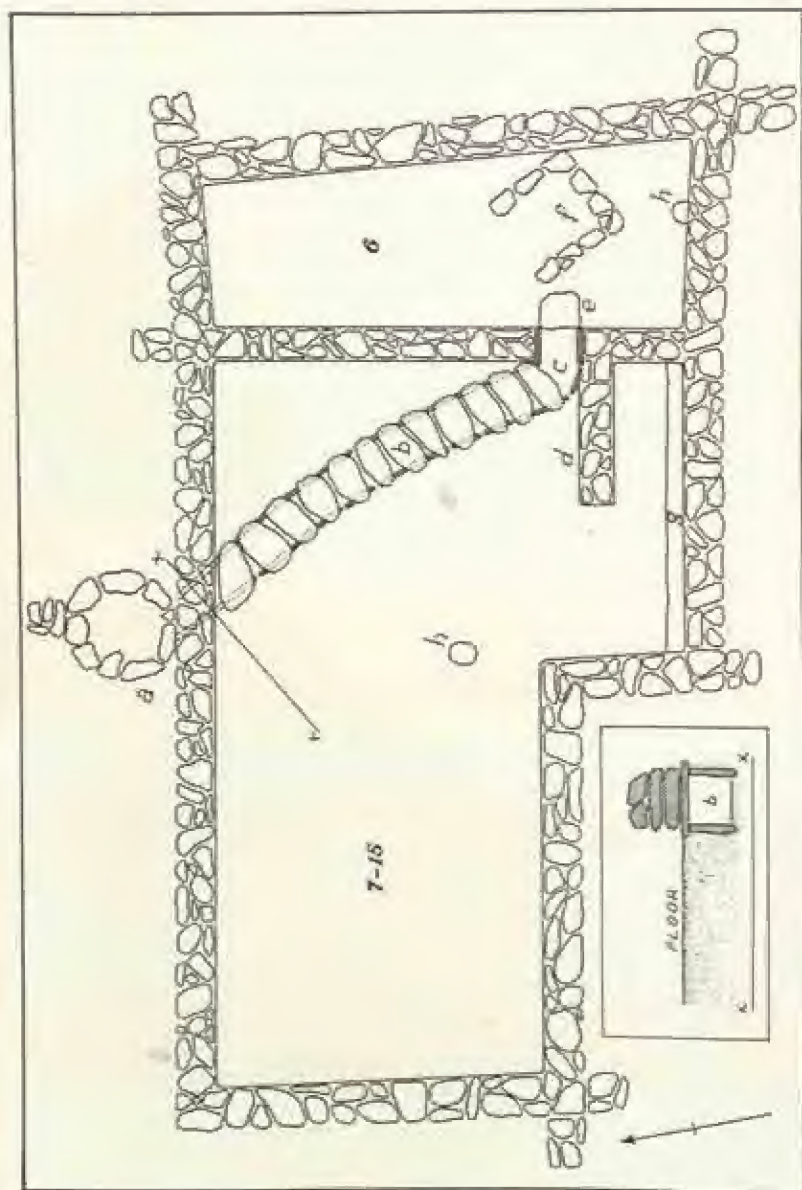
FIREPLACE WITH STONE-LINED BOX, AND STONE PLATFORMS



a. In the foreground is a stone-lined shaft outside the room wall, with sub-floor air duct leading to the fireplace in the party wall



b. The outside shaft before the room wall was removed (page 22)



Abstracting System in Kyushu Room 716

The line xx, section through wall and air duct: *a*, outside shaft (long axis); *b*, foot 6 inches; short axis; *c*, foot 4 inches; depth; *d*, foot 3 inches; *e*, sub-floor air duct 16 inches wide and 12 inches high entering room; *f*, 12 inches wide and 9 inches deep under room floor; lined on sides and covered with stone slabs; *g*, fireplace; *h*, short deflecting wall; *i*, dressed stone slab on floor; *j*, single course of stones set in rubble on floor, supporting *k* balc; *l*, board 6 inches wide and 12 inches high; *m*, skinned rafters from *n* to *o* and *l* 2 inches high.



a. Two Tularosa bowls inverted over an El Paso polychrome olla



b. Bowls removed from the olla which contained the calcined bones (page 26)

CREMATION



a, Semi-flexed on back



b, Semi-flexed on side (page 26)

TYPICAL MIMBERS BURIAL POSITIONS



a, Closely flexed



b, One of the few skeletons found seated (page 20)

TYPICAL MINNESOTA BURIAL POSITIONS



a, A bowl inverted over the skull and a metate over the body



b, Coverings of burial tipped back showing the killing of both metate and bowl (page 28)

GRAVE OF A WOMAN



a. Infant burials 692 and 693 below floor of Room 73



b. Burials 406, 407, and 408, below floor of Room 39 (page 28)

POTTERY *in Situ*



a, Inside of the room outlined by a shallow trench



b, Fill of the room cleared to within five or six inches of floor level (page 29)

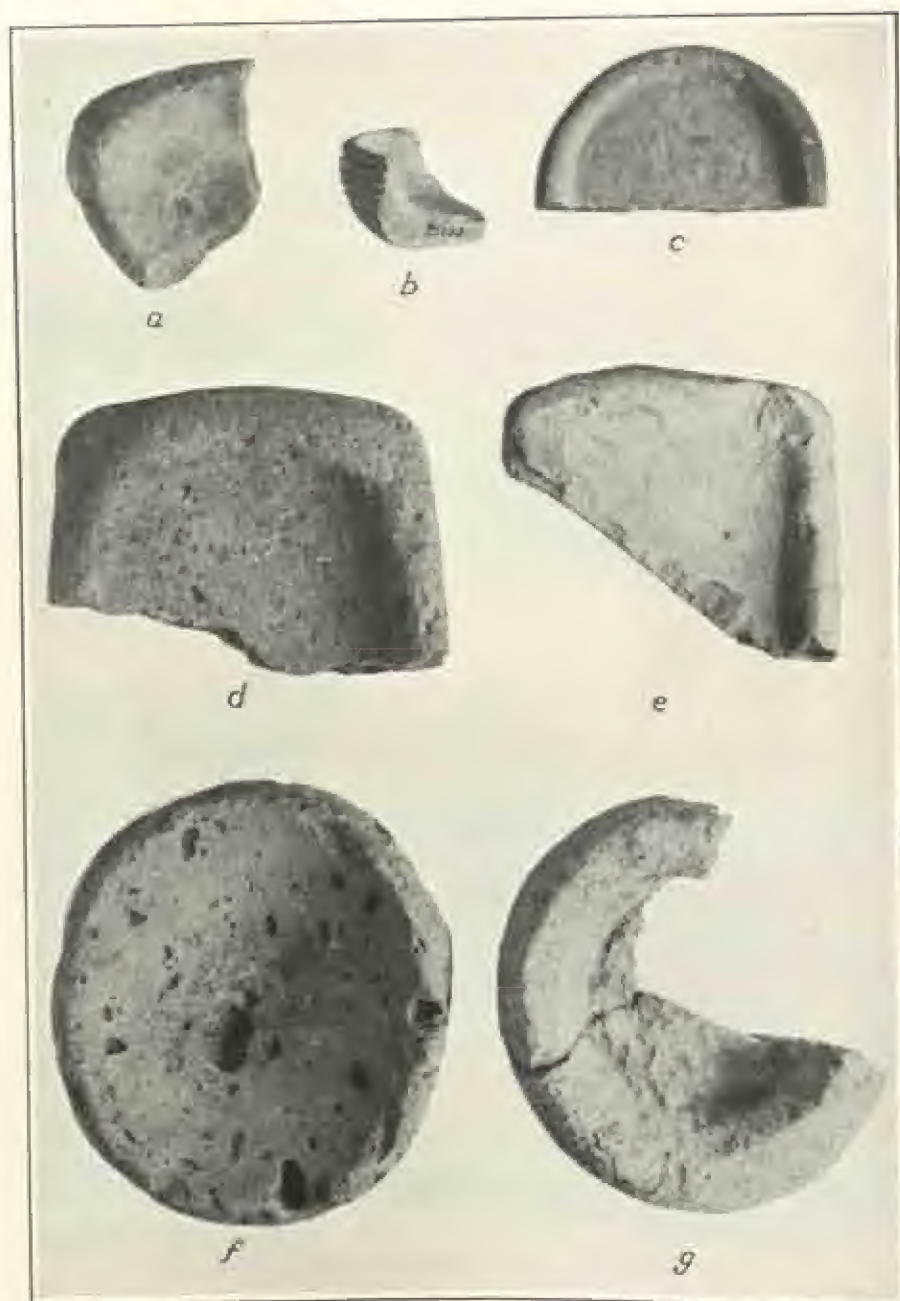


a. The room cleared to floor level, showing skeleton on floor (page 29) and central roof post



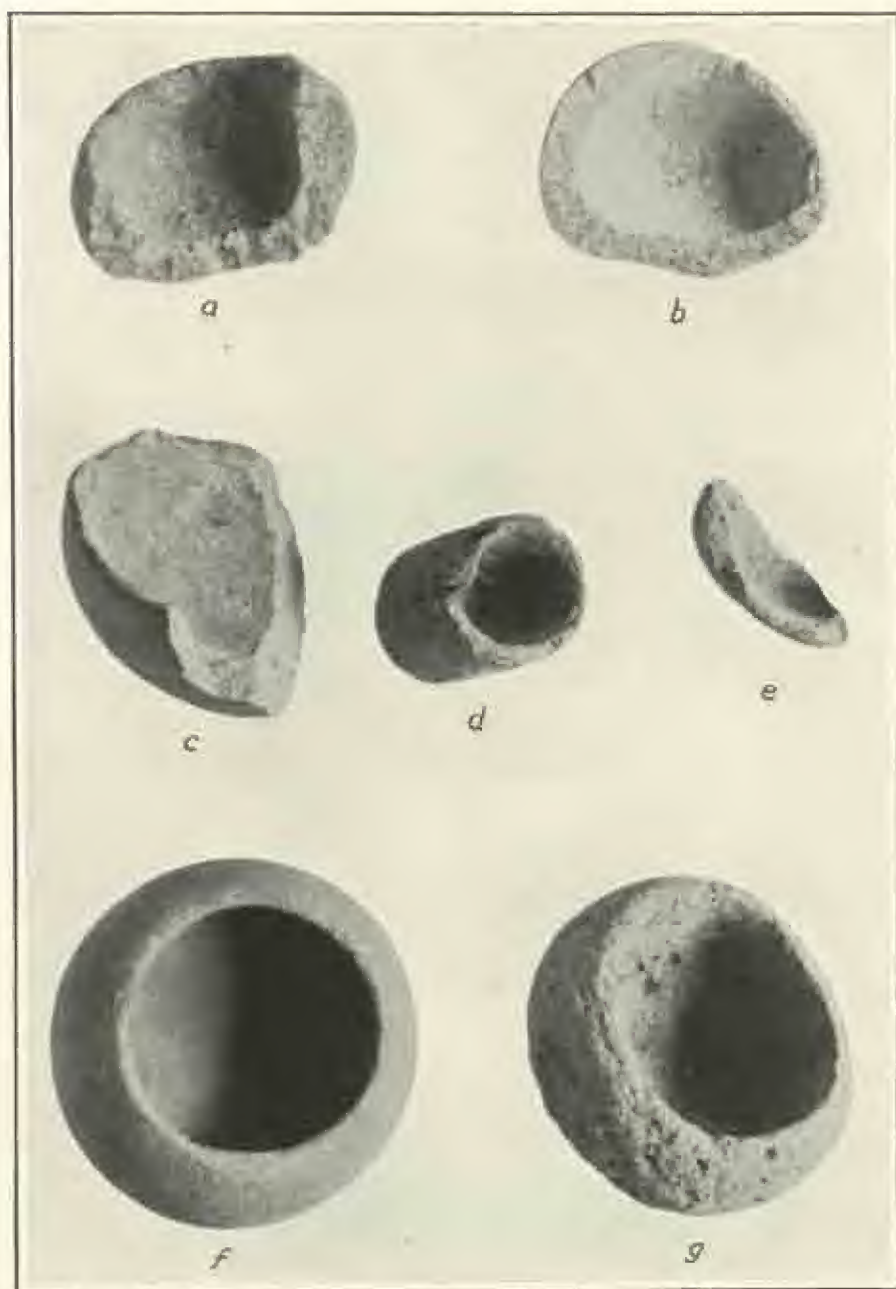
b. Graves with offerings below floor; floor level is shown by ridge on the back wall two thirds of the distance below the surface (page 30)

METHOD OF EXCAVATING LATE ROOM 53



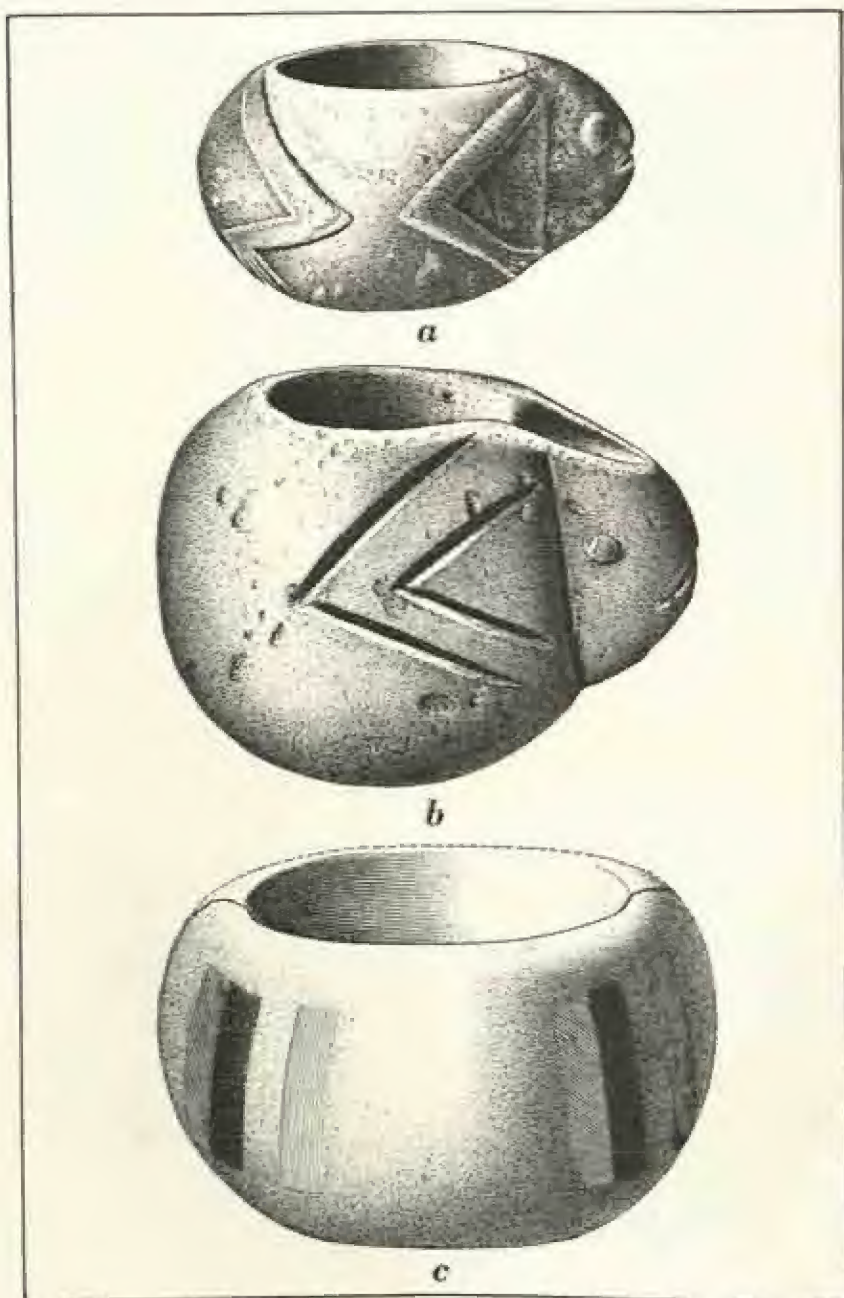
STONE INSULA

The specimen *a*, of tuff, was found below floor of Room 32; *b*, of tuff, general digging; *c*, of tuff, from N A N Rapch Ruin; *d*, of lava, on floor of Transitional Period Room U; *e*, of sandstone, in fill of Room 50; *f*, of tuff, in fill of Room 31; *g*, of tuff, general digging. Specimen *f* is 7 inches in diameter (page 31)



STONE BOWLS

The bowl *a*, of tuff, was found on floor of Transitional Period Room K; *b*, of tuff, in fill of Transitional Period Room V; *c*, of tuff, below floor of Room 39; *d*, a cup of tuff, below floor of Room 110; *e*, of tuff, from general digging; *f*, of sandstone, on floor of Room 72; *g*, of tuff, in fill of Room 97. The specimen *f* is $2\frac{1}{4}$ inches in diameter (page 32)



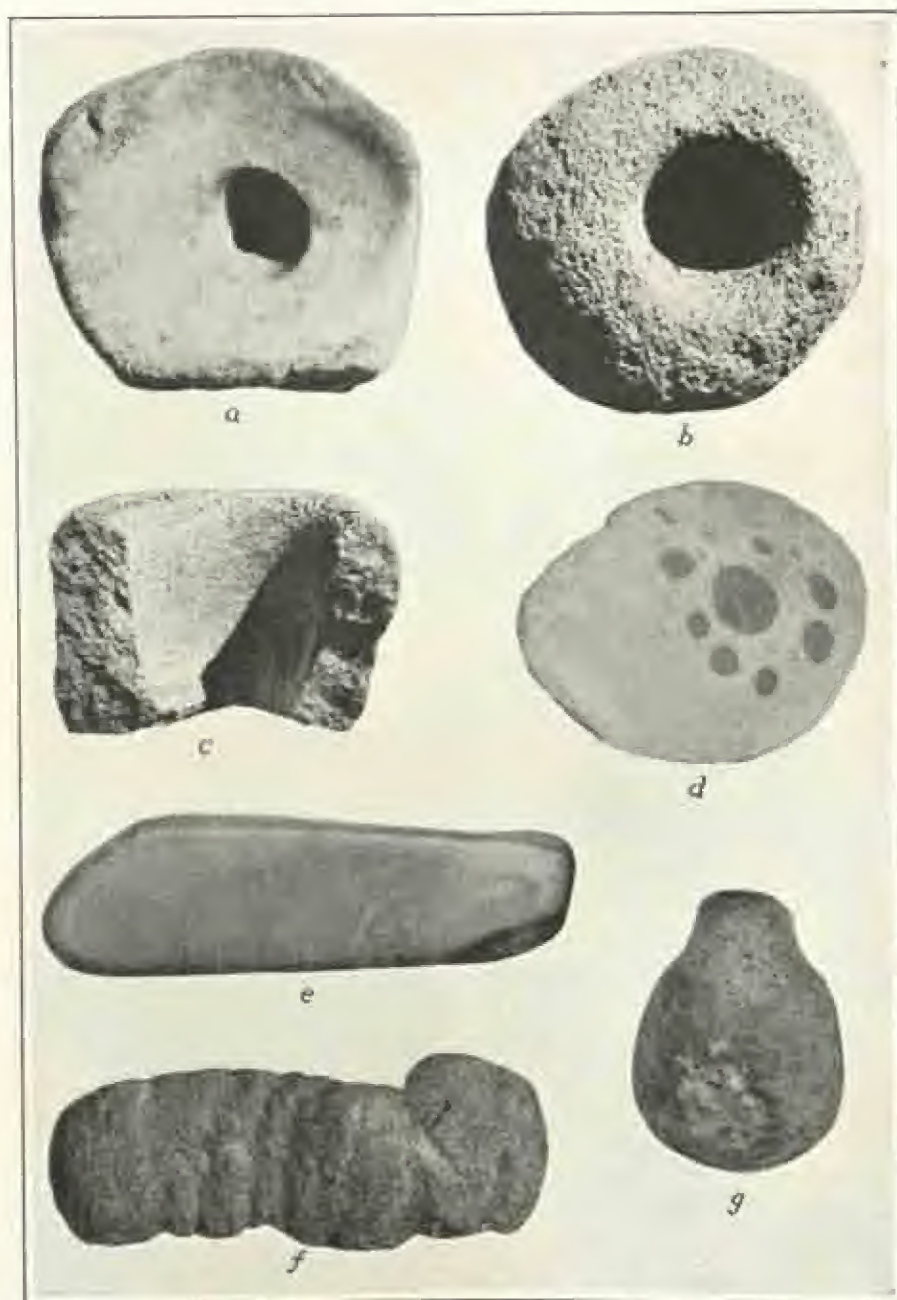
CARVED AND PAINTED STONE BOWLS

The bowl *a* was found on the floor of Room 23; *b*, on floor of Room 34; both are cut out of tuff. The painted sunstone bowl *c*, restored in drawing, was found on floor of Room 24. Specimen *c* is 4½ inches in diameter (page 22).



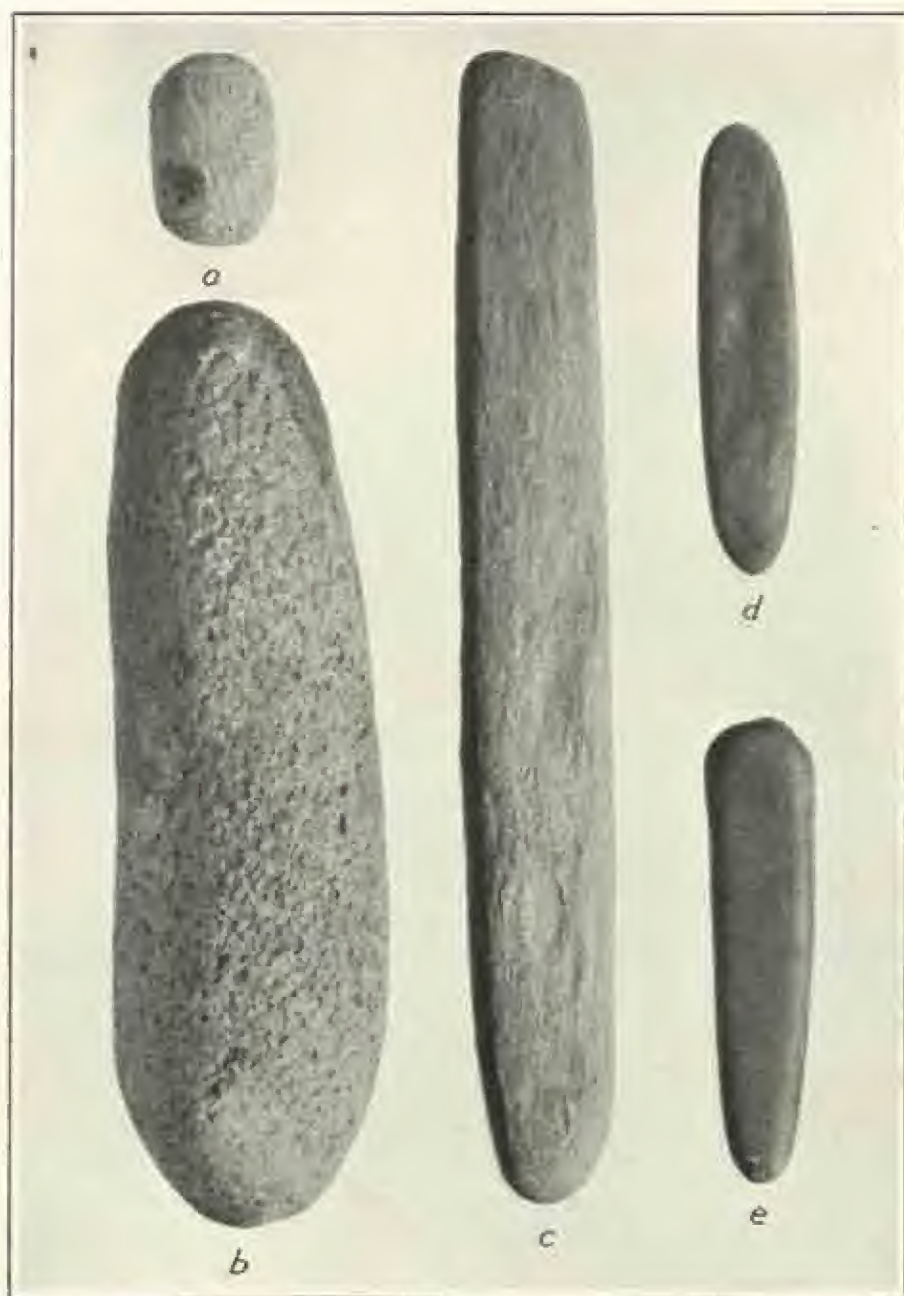
SMALL MORTARS AND PAINT CUPS

Specimen *a*, of tuff, was found below floor of Room 71; *b*, of tuff, below floor of Room 83; *c*, of sandstone, on floor of Room 82; *d*, of lava, in fill of Room 21; *e*, of tuff, below floor of Room 92; *f*, of lava, on floor of Room 101; *g*, of tuff, in fill of Room 99. The mortar *f* is 10 inches long (page 33)



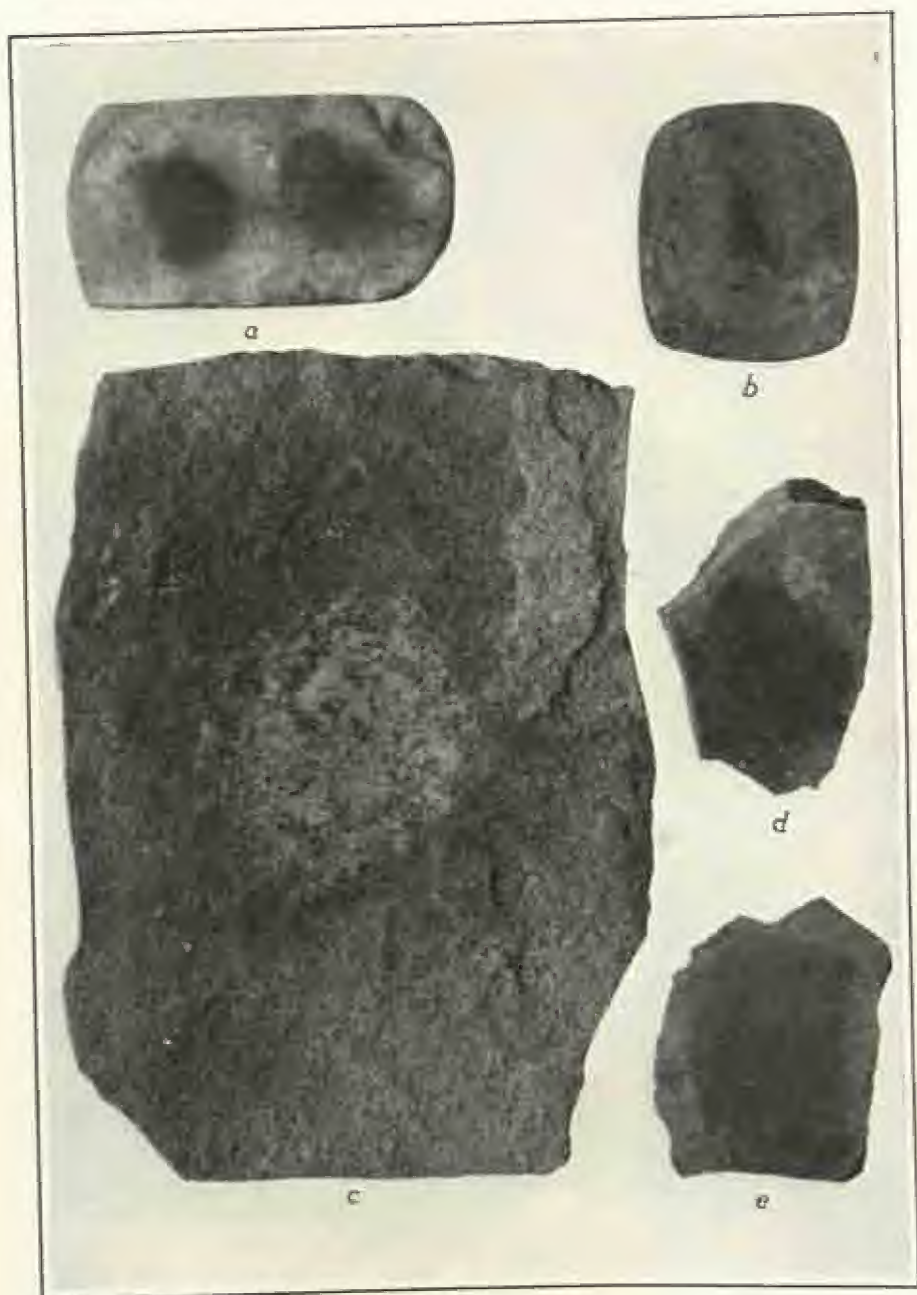
LARGE MORTARS AND MISCELLANEOUS STONE ARTIFACTS

The large mortars *a-c*, found at Swarts, are typical of the Mimbres area; *a* has a maximum outside diameter of 17 inches (page 33); *d*, a river boulder with small mortar holes, was incorporated in the south wall of Room 5 (page 33). The beaming tool *e* is 18½ inches long (page 41); the channeled stone *f*, suggesting a caterpillar, is 47½ inches long (page 54); and the dummy bottle *g* is 9 inches tall (page 54).



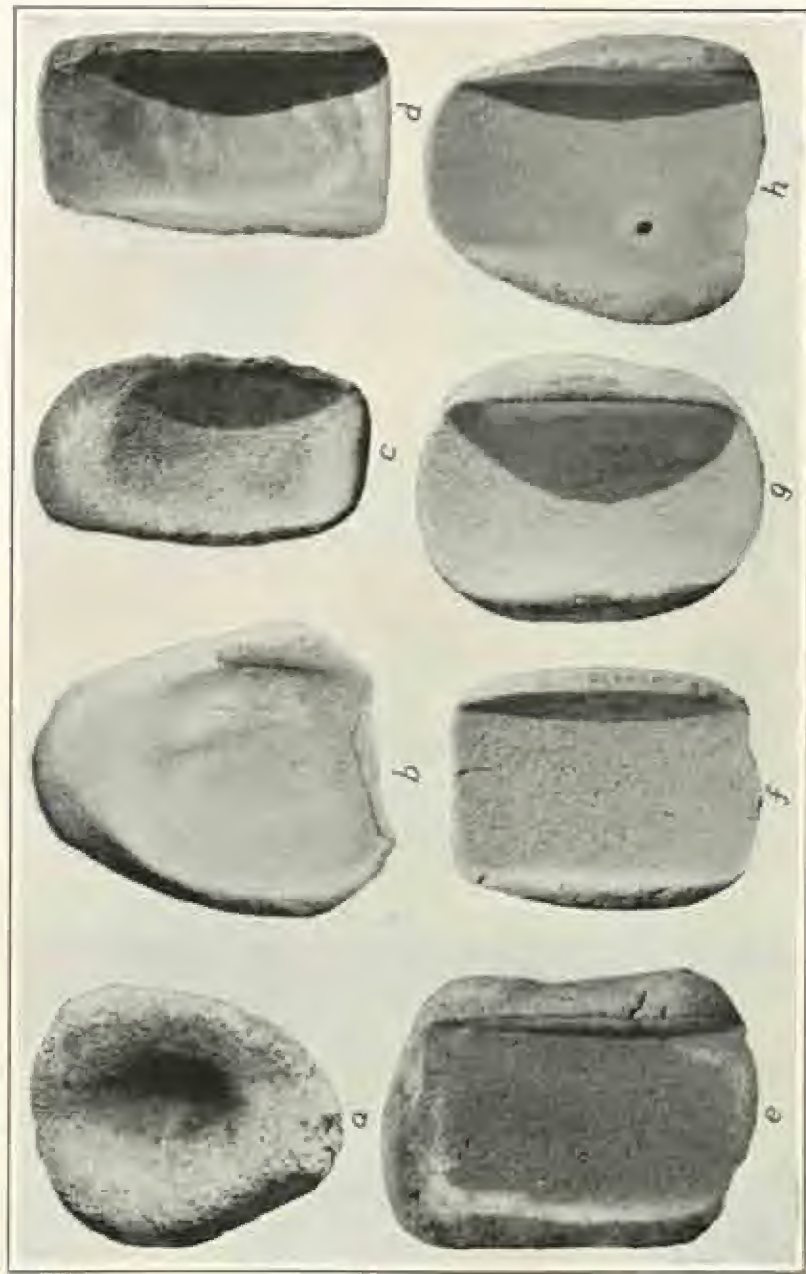
PEBBLES

Specimen a, of tuff, came from general digging; b, of lava, on floor of Room 63; c and d, of amphibolite schist, below floor of Room 59; e, of brown quartzite, below floor of Room 37. The pebble c is 17½ inches long (page 34)



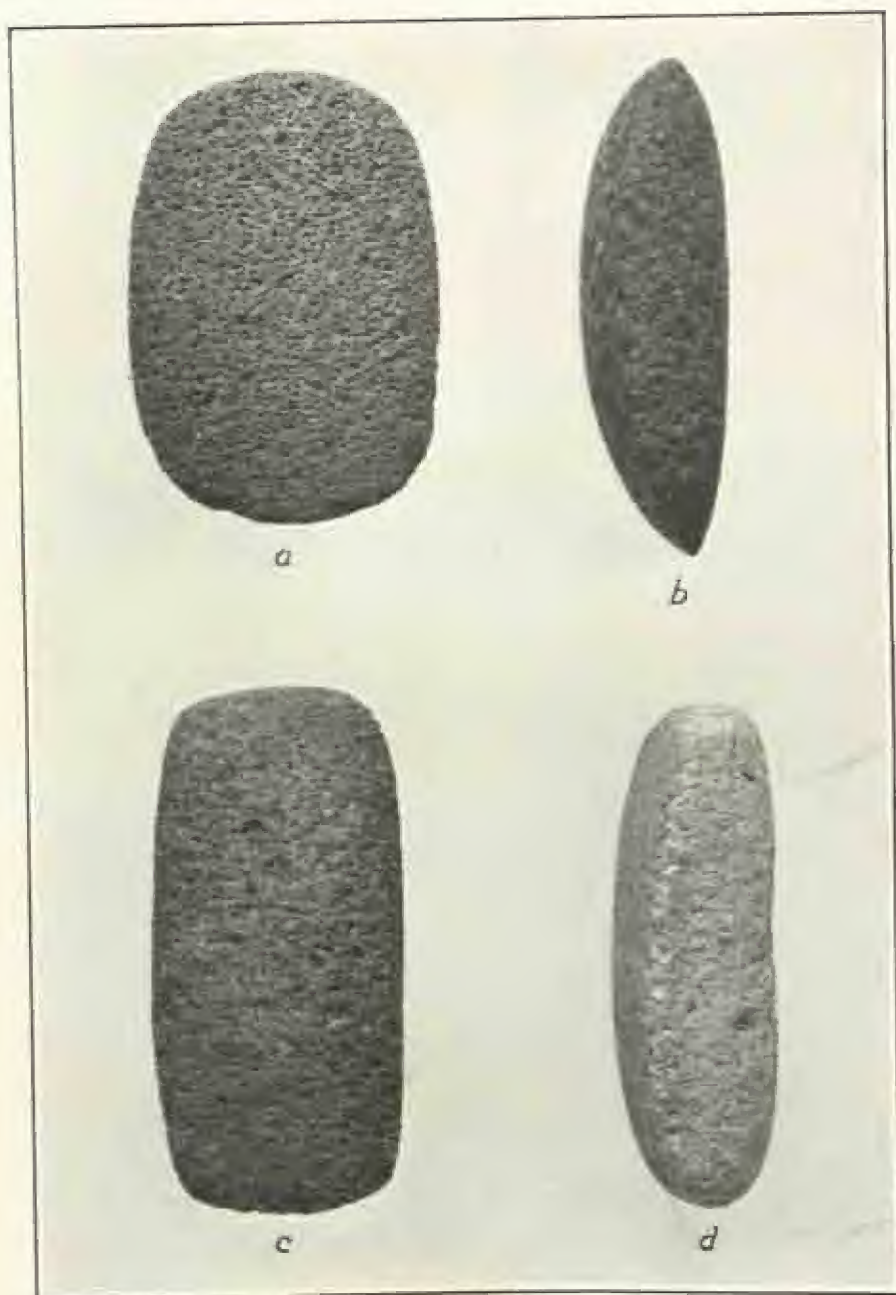
PALETTES

Smooth stones having rubbed surfaces discolored with oxides; *a* was found on floor of Room 68; *b*, below floor of Room 40; *c*, on floor of Room 68; *d*, general digging; *e*, below floor of Room 68A. The stone *a* is daubed with two shades of red; the reverse of *c* is colored with blue and black pigment. Specimen *c* is $11\frac{1}{4}$ inches long (page 35)



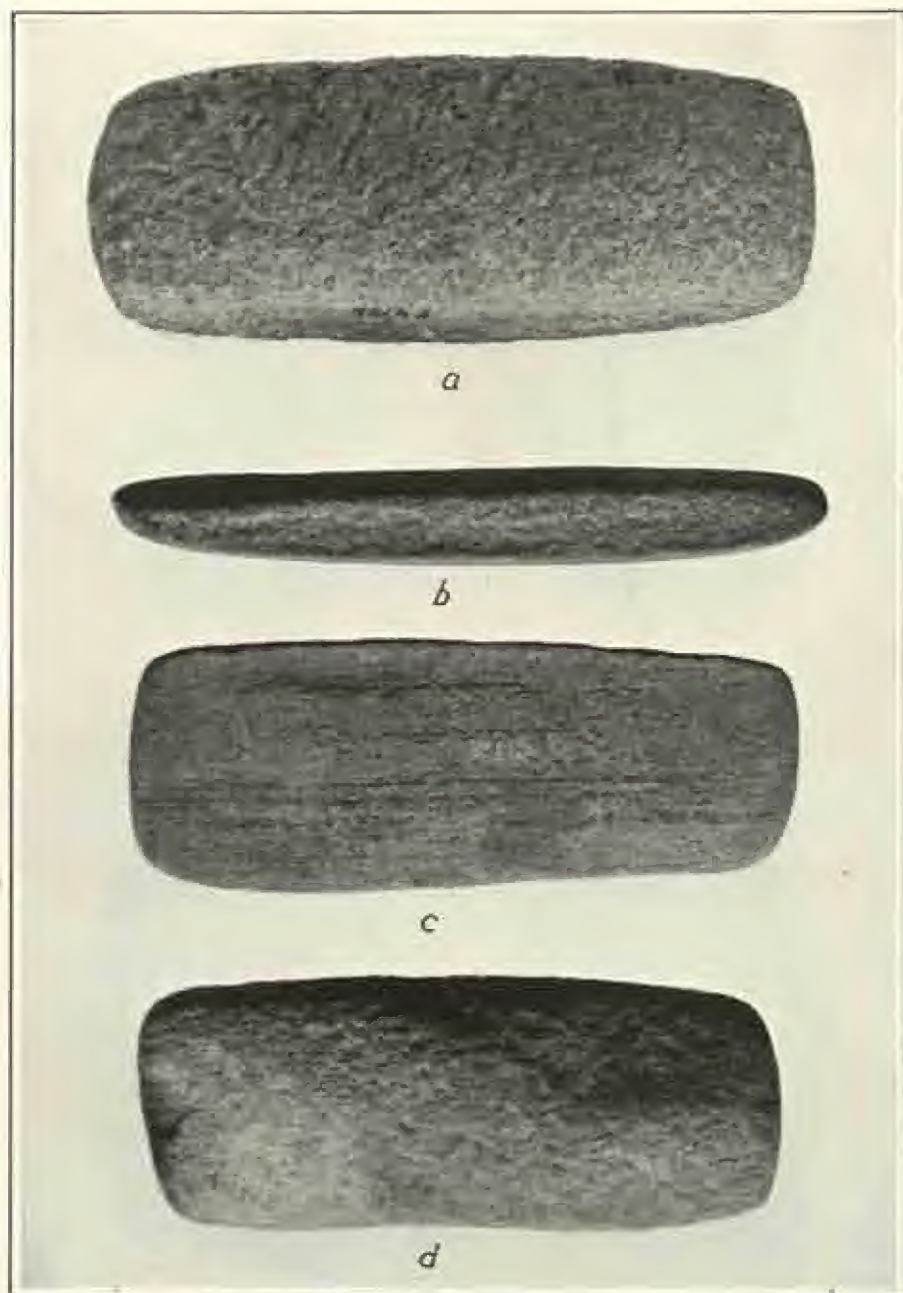
MURATTUS

Upper row, developmental series: a, Type 1; b, Type 2; c, Type 3; d, Type 4. Lower row, typical Late mutation. Specimens a, e, e', e'', and h are of volcanic basalt; b, of porphyritic thysolite; d and g of sandstone. The notate d is 174 inches long (page 32).



EARLY TYPE MANOS

Specimens *a* and *b* are turtle-back, rocker-bottom manos of lava, used in Type 2 metate, *a*, grinding surface and *b*, edge; *c*, of lava and *d*, of porphyritic rhyolite, show two views of Transitional manos with round grinding surfaces which fit Type 3 metate. Specimen *d* is $3\frac{1}{4}$ inches long (page 37)



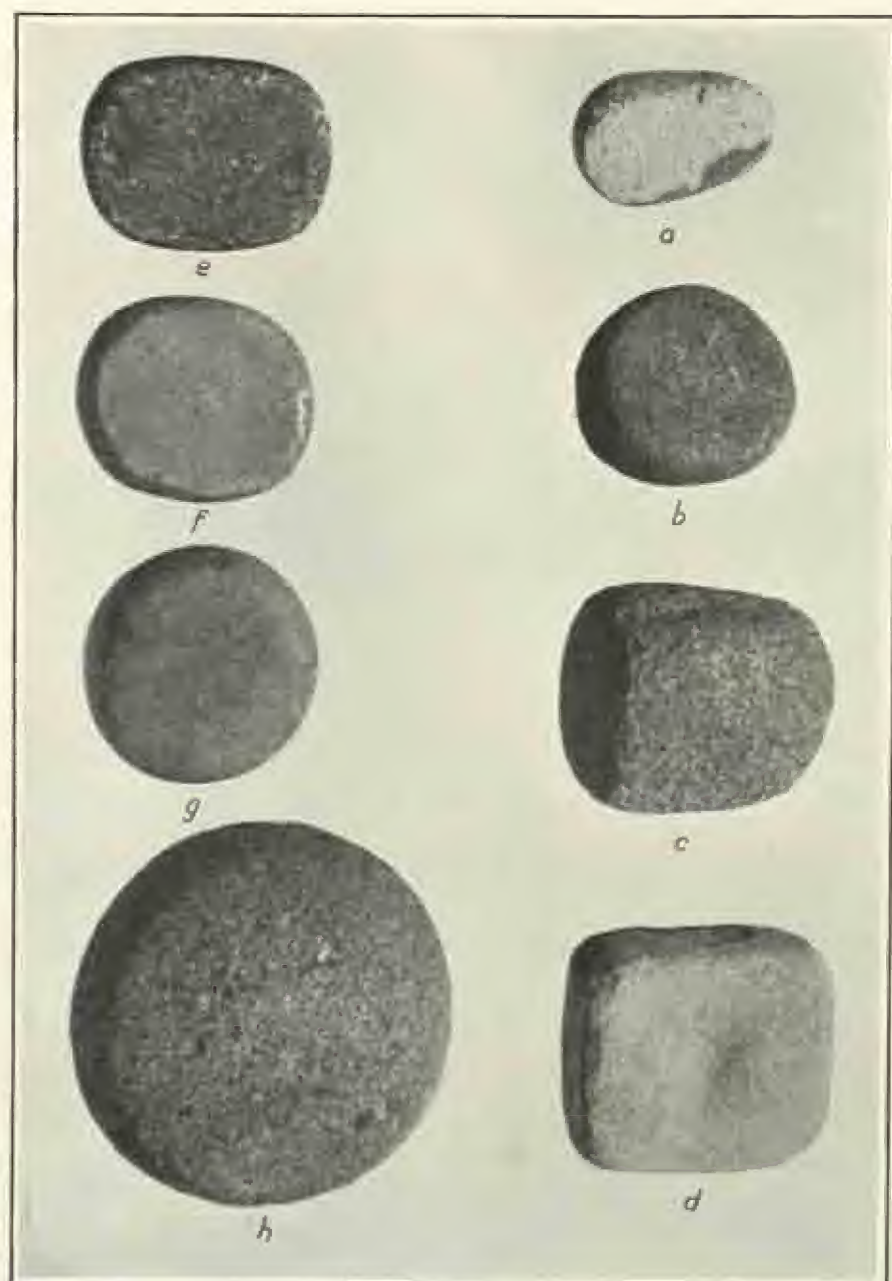
LATE TYPE MANOS

The manos *a* and *b* are of porphyritic rhyolite; *c*, of sandstone; *d*, of fine grained conglomerate. The mano *a* is unfinished; *b-d* show edge, grinding surface, and back of hand stones used on Type 4 metate. Specimen *a* is 11 inches long (page 37)



SMALL METATE-LIKE GRINDING STONES

Specimens *a*, of sandstone, and *d*, of tuff, were found below floor of Early Period Room AB; *b*, of lava, in fill of Room 39; *c*, of tuff, in fill of Room 8L. The stone *b* is 10 inches long (page 38)



RUBBING STONES

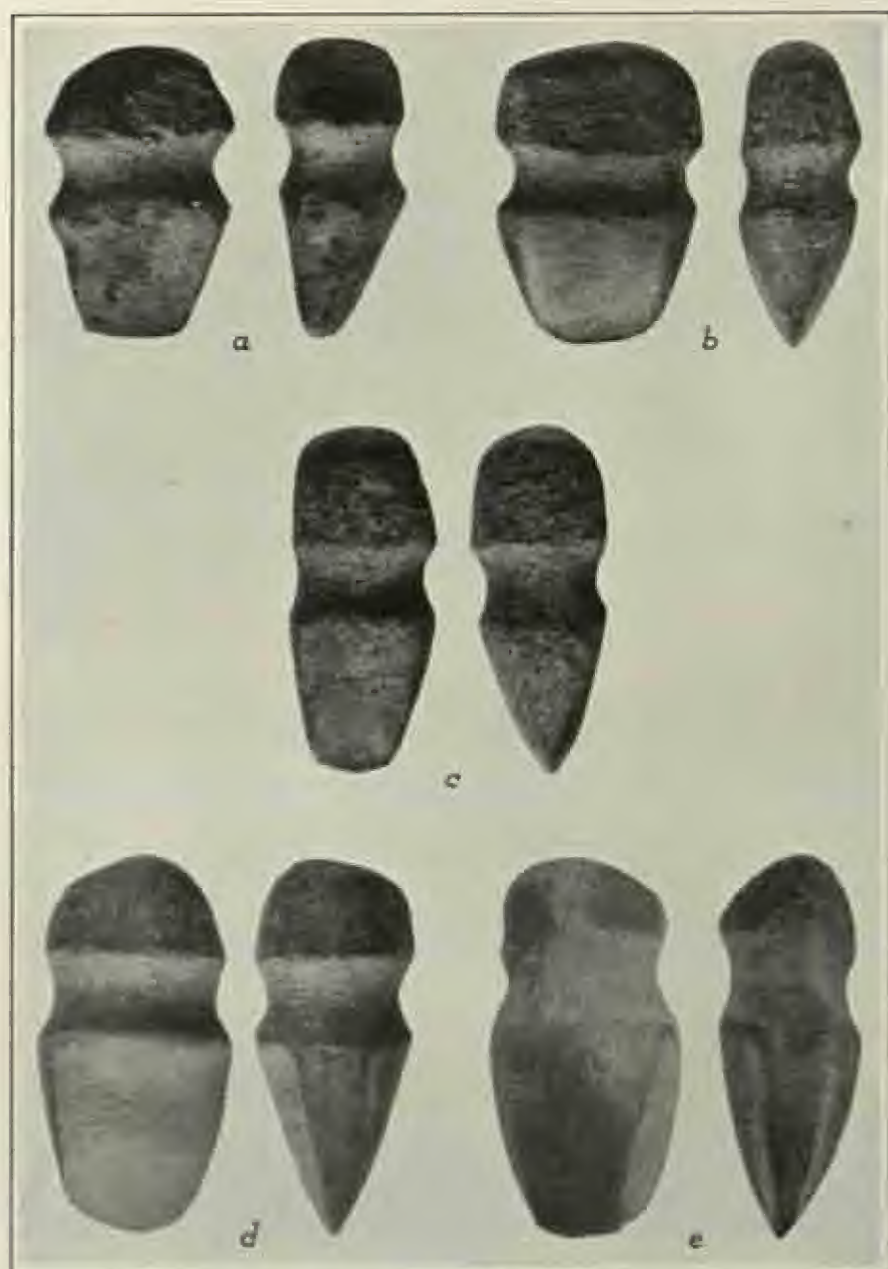
Specimen *a*, of tuff, came from below floor of Middle Period Room R; *b* and *c*, of lava, from general digging; *d*, *f*, and *g*, of sandstone, from general digging; *e*, of fine grained conglomerate, from general digging; *h*, of coarse grained porphyritic rhyolite, in fill of Middle Period Room Y.

The stone *h* is 6½ inches in diameter (page 28).



Stone axe Head or Transverse-sectioned AXES

All size of distance except *e*, which is of basal. The axe *a* came from below floor of Room 7; *b*, below floor of Room 20; *c*, below floor of Room 50; *d*, on floor of Room 100; *e*, on floor of Transitional Period Room U; *f*, from below floor of Room 118. The axe *f* is 7 1/2 inches long (page 41)



SIZE AND LOCATION OF FLINT-POINTED ARROWS

All are of diabase. The set *c* was found on floor of Room 29; *b*, in fill of Room 22; *a*, below floor of Room 53; *d*, in fill of Room 72. Specimen *d* is 5½ inches long (page 41).



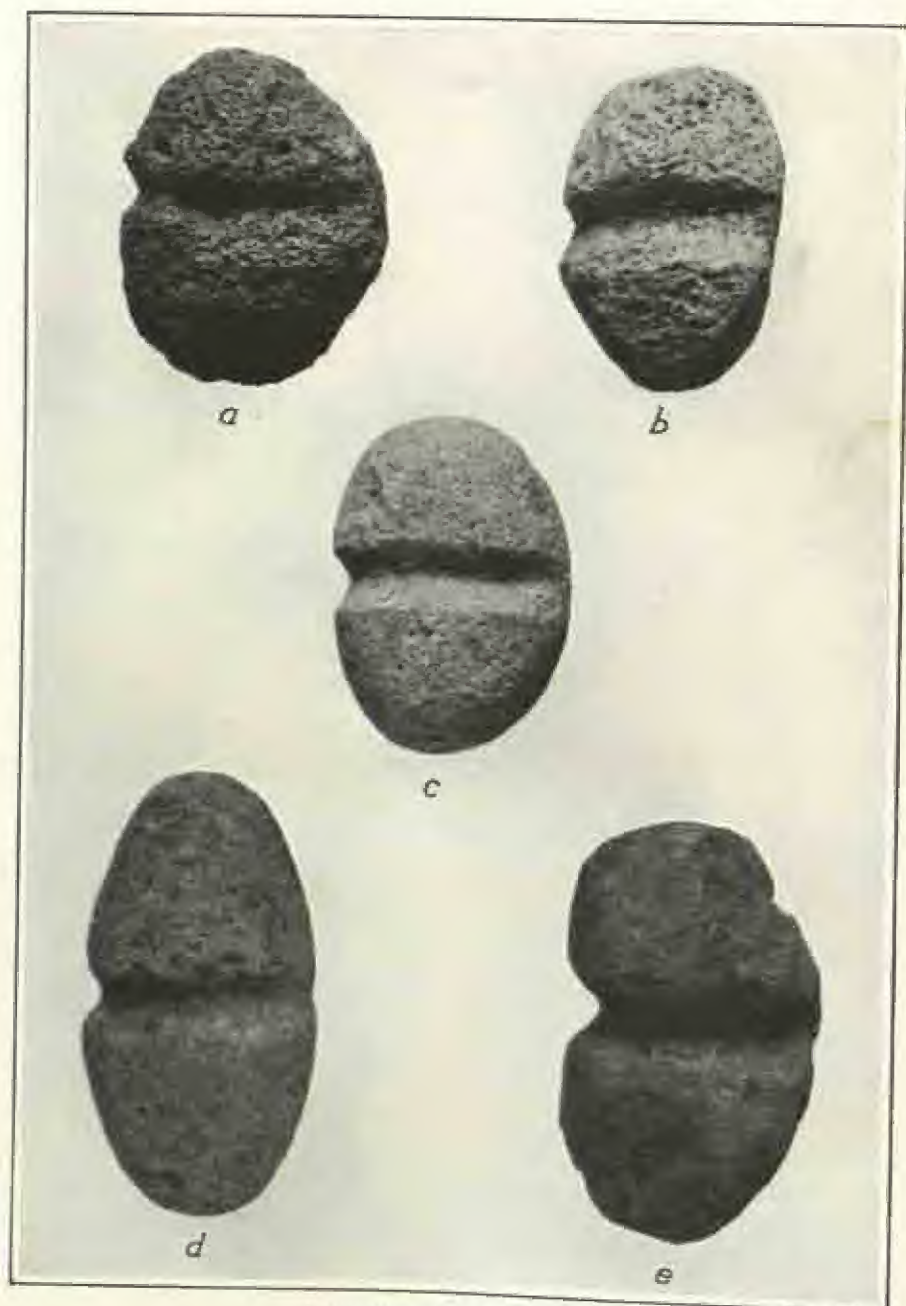
Size and Shape of Axes with *Parvocrater Rodens*

All are of diabase except *c* which is of quartz mica schist; *a* came from below floor of Room B; *b*, outside north wall of 7-15; *c*, from below floor of Plaza 13; *d*, on floor of Room 108; *e*, an unusual form, was found on floor of Early Period Room Z. The size of *e* is 7½ inches long (page 41).



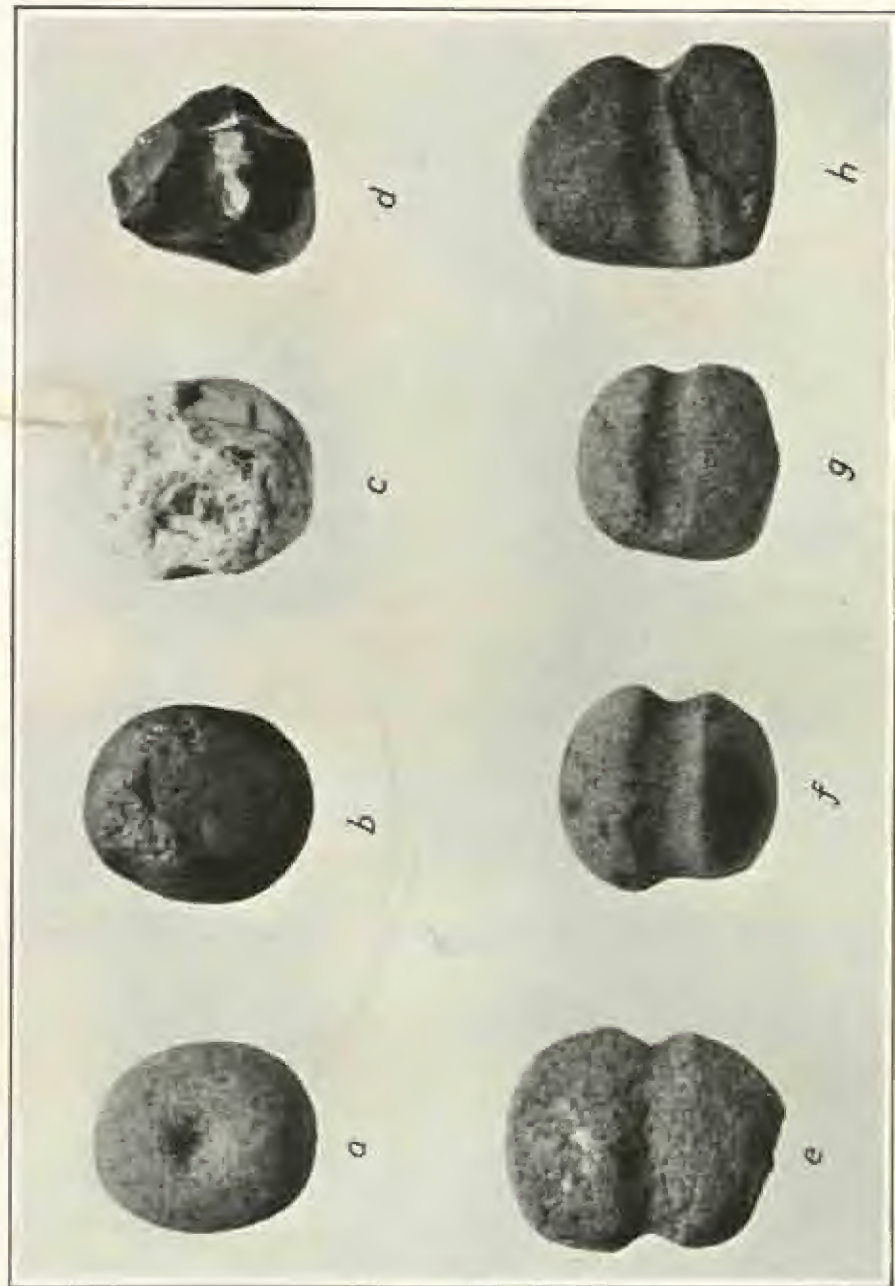
FULL-GROWNED MAYA

The mass *a*, of coarse grained porphyritic rhyolite, was found below floor of Room 39; *b*, of porphyritic rhyolite, on floor of Room 2; *c*, of tuff, below floor of Plaza 18; *d*, of lava, from general diggings; *e*, of lava, on floor of Room 27. Specimens *d* to *e* (about long (page 43).



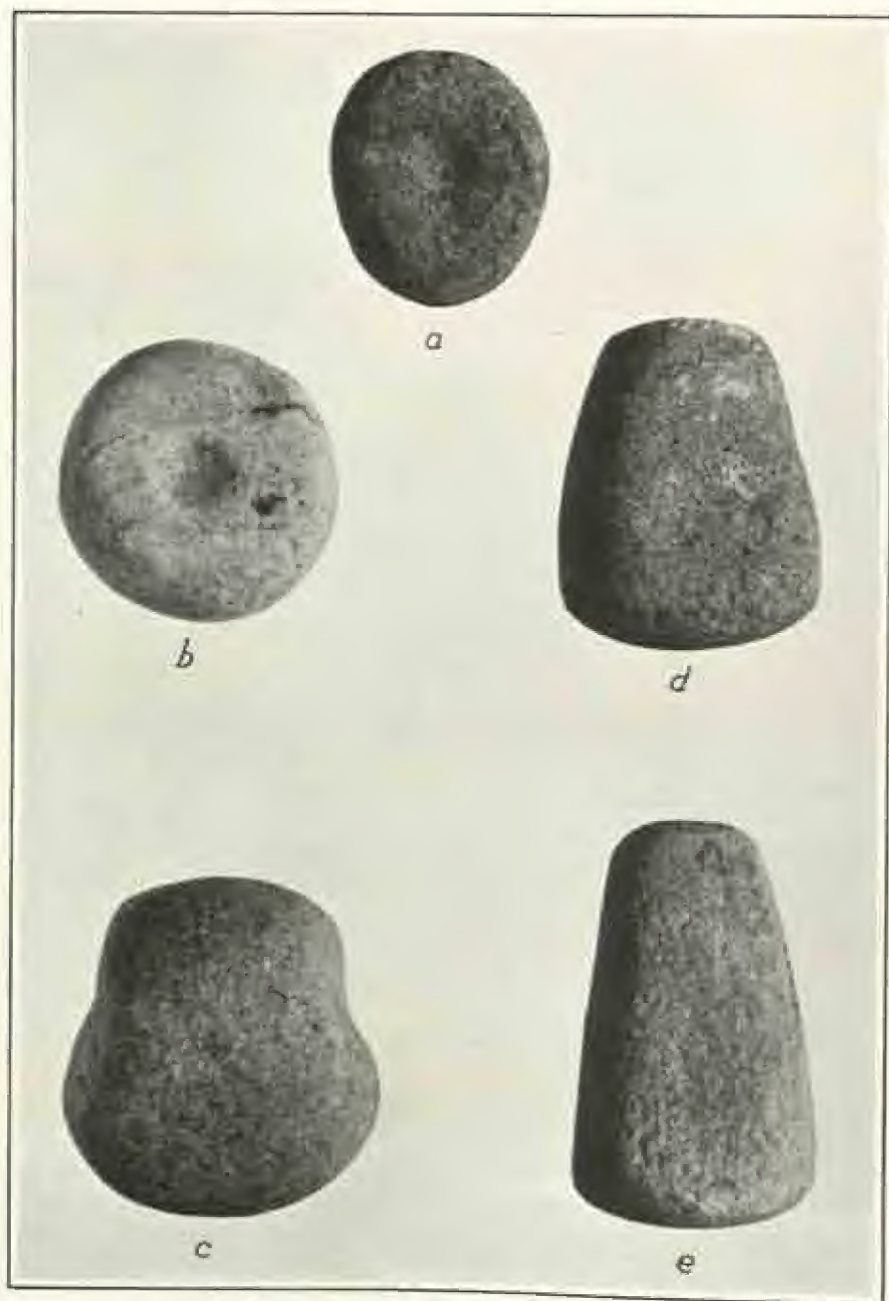
THREE-CASTLES-SUMMIT MAFIC

The masses *a* and *c* are of lava, the rest of porphyritic rhyolite. Specimen *a* was found north of Room 103; *b* came from general digging; *c*, from below floor of Room 108; *d*, in fill of Room 68; *e*, below floor of Plaza 13. (Specimen *d* is 6½ inches long (page 43).)



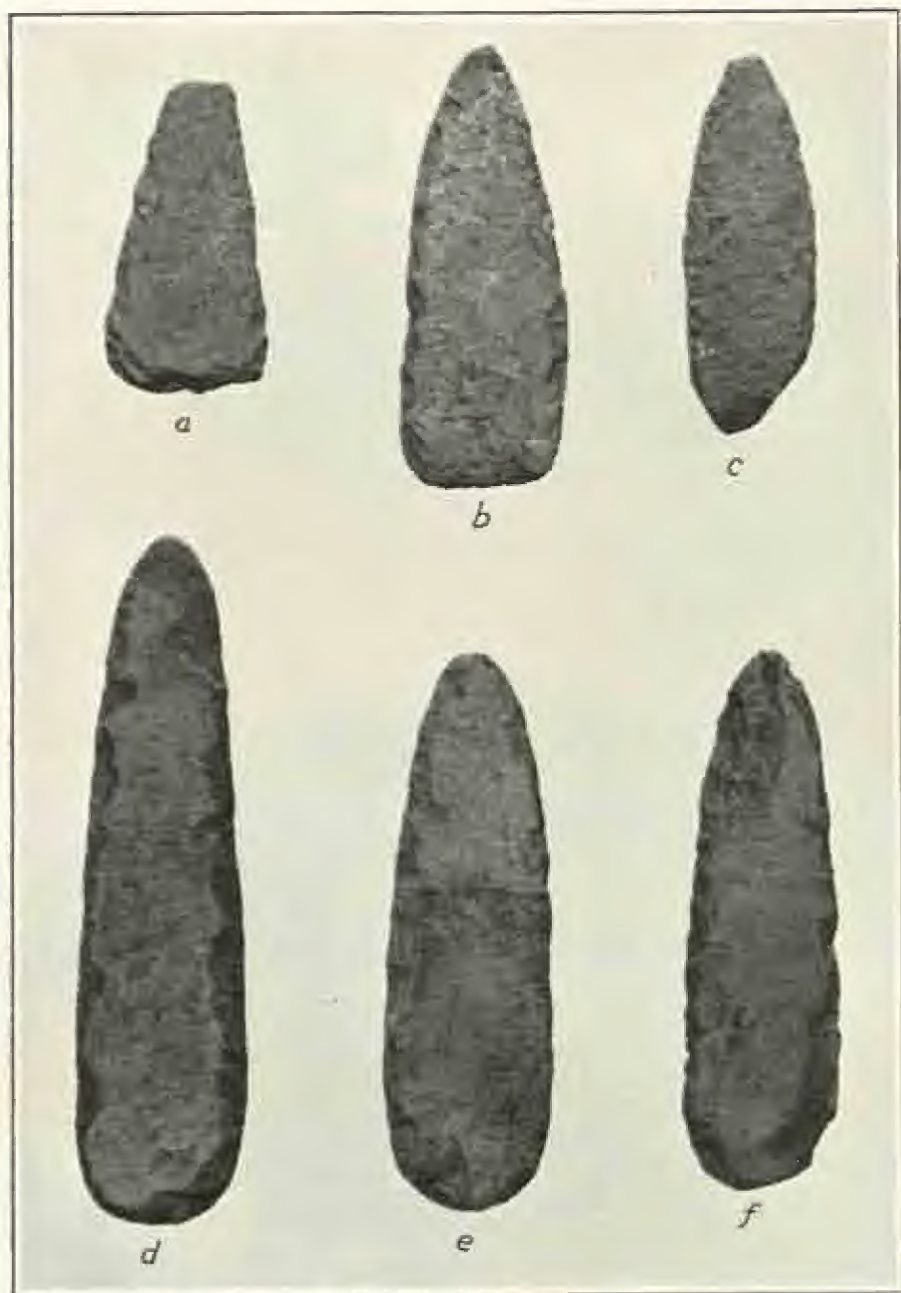
HAMMER STONES AND CLUB HEADS

The hammer stones *a*, *b*, *c*, and *d* came from general digging; *a*, a discoidal hammer stone with flange holds, is of porphyritic rhyolite; *b*, of magnetite; *c*, of white rhyolite foliated; *d*, of basalt. The club head *e*, of flint, came from below floor of Room 40; *f*, of diabase, below floor of Room 101; *g*, of diabase, on floor of Room 37; *h*, of diabase, from general digging. Specimen *a* is 3 inches in diameter (page 44).



POUNDRING STONES AND CHURNING IMPLEMENT

The pounding stones *a*, of lava, and *b*, of sandstone, came from general digging; *c*, of porphyritic rhyolite, in fill of Room 87; *d*, of porphyritic rhyolite, on floor of Room 16; *e*, of sandstone, on floor of Room 113. Specimen *e* is 6 inches long (page 45)



STONE HOES

All are of olivine andesite. The hoes *a*, *c*, and *d* were found on floor of Room H; *b*, below floor of Room 107; *e*, below floor of Room 28; *f*, from general digging. Specimen *d* is 10 inches long (page 43).



STONE CORES AND A LARGE SCRAPER

The stone cores *a* and *b* are typical nuclei; *c* is a large scraper of red felsite, from the plain area between North House and South House. Specimen *c* is 6½ inches long (page 46).



TYPICAL SMALL SCRAPERS
The scraper *h* is $2\frac{1}{4}$ inches long (page 46)



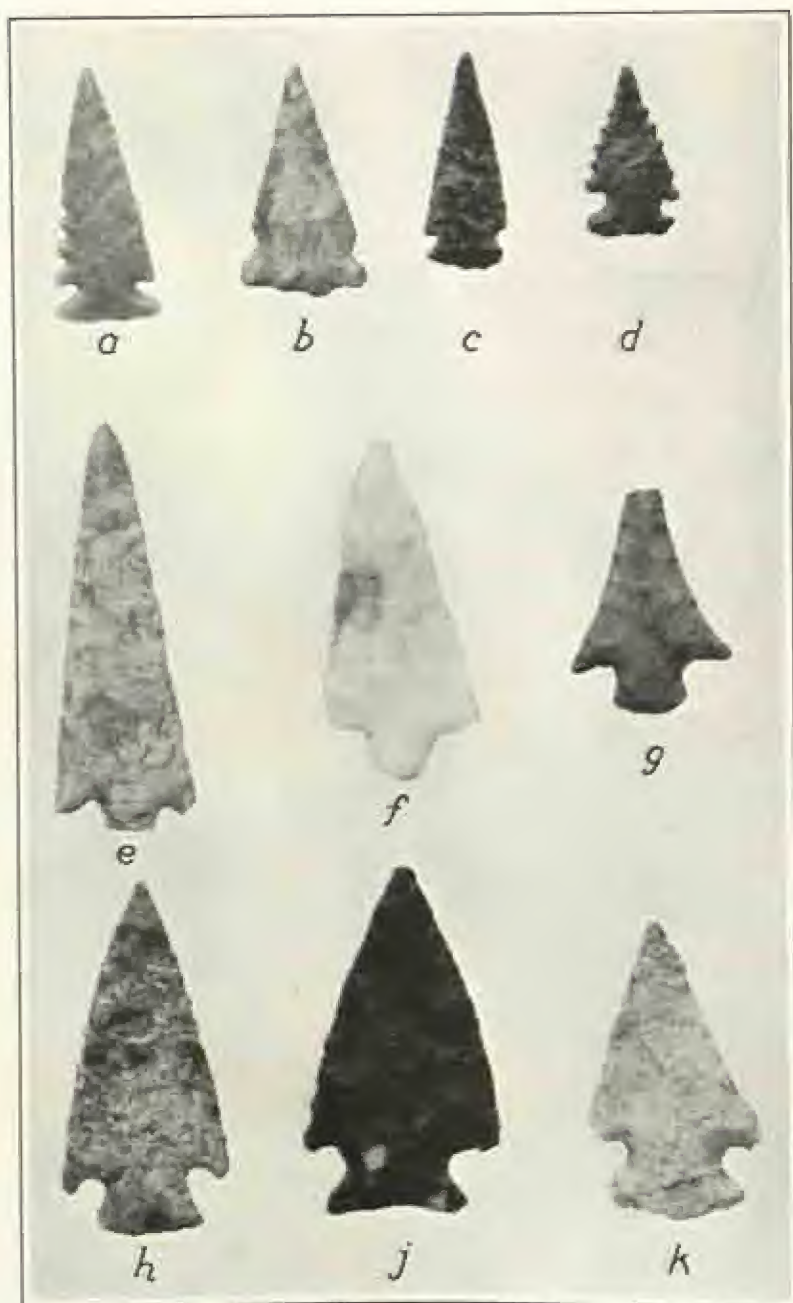
CURVED-EDGE FLAKE KNIVES

Specimen *a* is of obsidian; *b*, of gray flint; *c*, *e*, and *g*, of flint; *d*, of gray talcite; *f*, of black talcite; and *h*, of white agate. Specimen *h* is 3½ inches long (page 47)



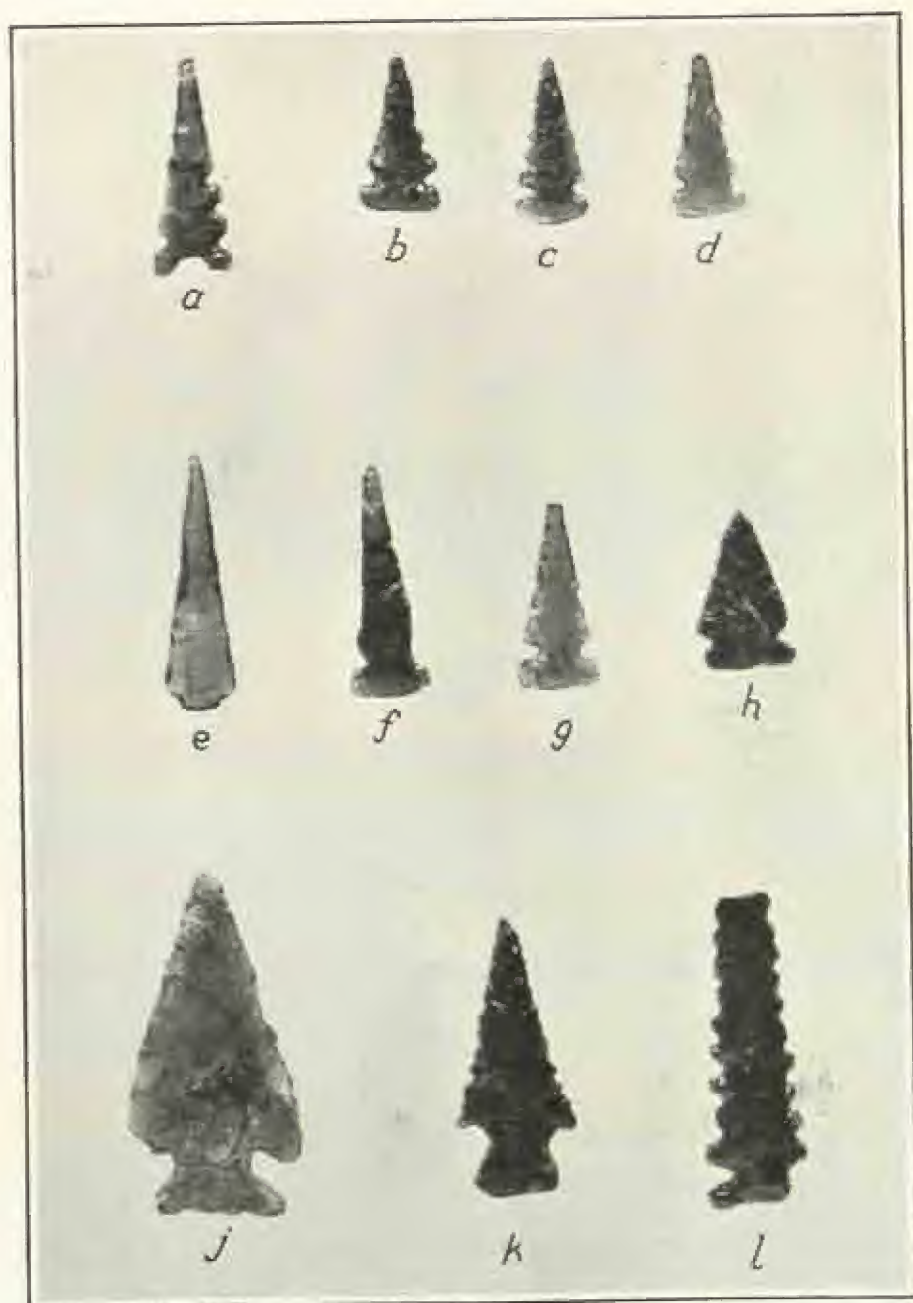
LARGE KNIFE BLADES FOR THRUSTING AND CUTTING

Specimen *a* came from fill of Room 108; *b* and *d*, from below floor of Room 53; *c*, from Ell of Plaza 13; *e*, from below floor of Room 71. Specimen *d* is 4½ inches long (page 47)



TYPICAL PROJECTILE POINTS

The points a-d have straight retouched bases and notches at right angles to their axes; e and f, straight tang; g, pronounced barb and curved edges; h-k, concave or convex retouched bases and oblique notches. Specimen e is 2 inches long (page 47)

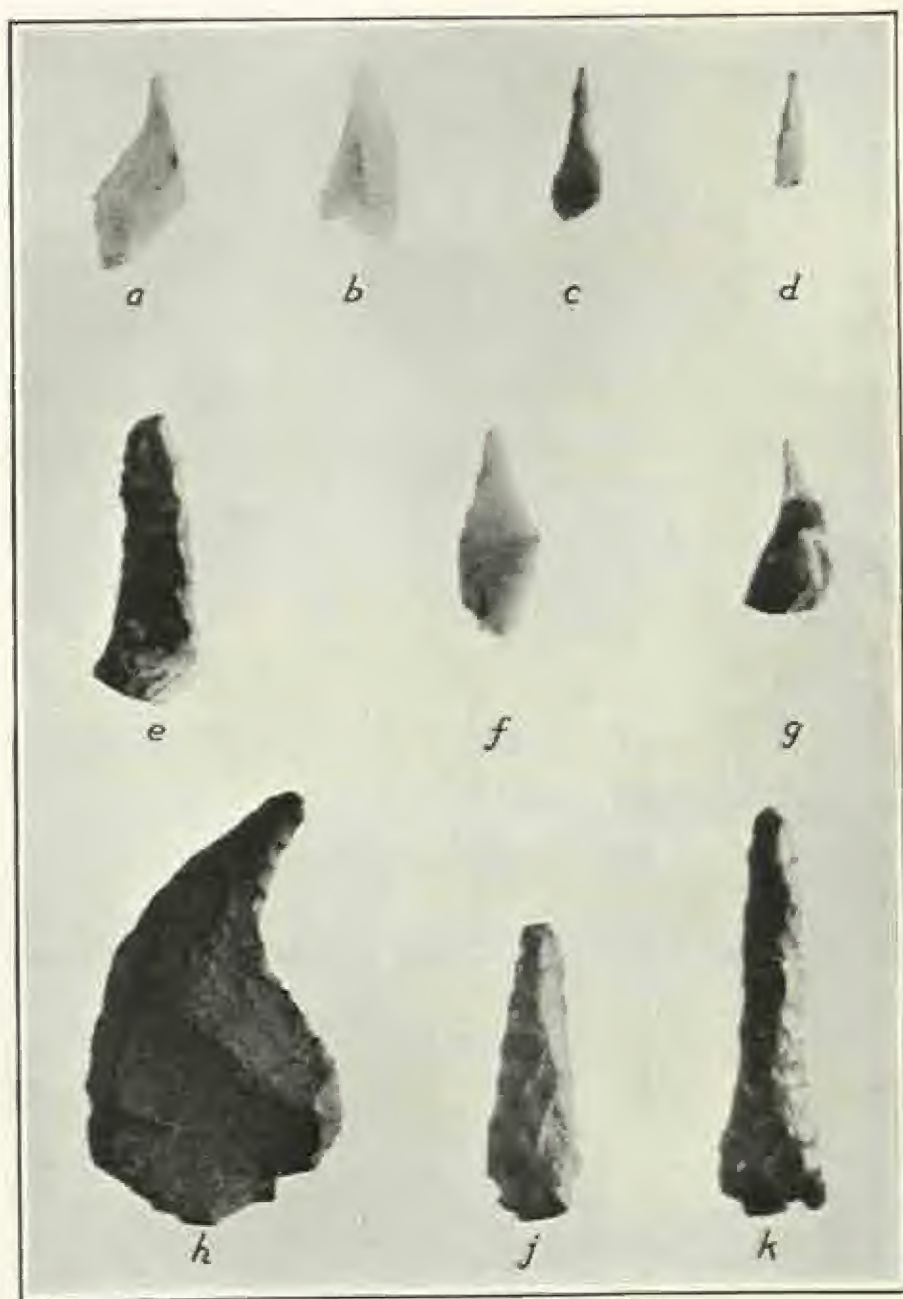


TYPICAL OBSIDIAN PROJECTILE POINTS
 The largest point is 1 1/2 inches long (page 47)



UNUSUAL PROJECTILE POINTS

The points *a* and *c* are of gray flint; *b* and *e* of red flint; *f* of clear flint; *h*, of yellow flint; *j*, of white flint; *d*, of brown agate; *g*, of red agate. Specimen *d* is 1½ inches long (page 47)



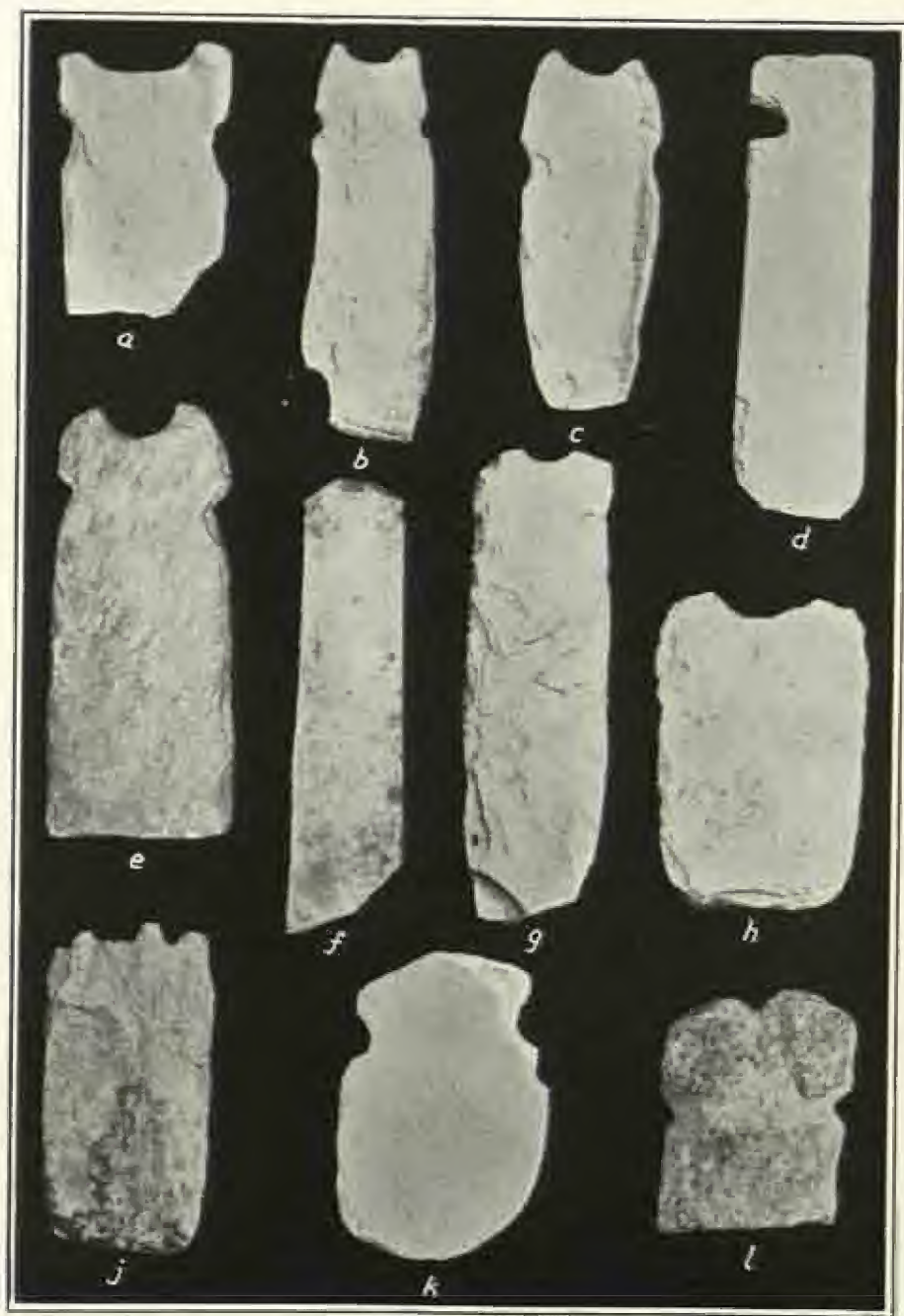
DANA. POWERS

The bead drills *a-d* and *f* are of flint; *g*, a bead drill, is of red agate; *e*, of gray agate; *h* and *j*, of black felsite; *k*, of red agate. The drill *i* is 2½ inches long (page 48)



STONE DOORS

The doors *a* and *b*, from Rooms 84 and 109, are of laminated tuff; *c*, miscellaneous small worked slabs; *d*, circular stone cover for storage *sila*; *e*, stone shovel (?). Specimen *a* is 2½ inches long. The assortment *c* is not in scale (page 48).



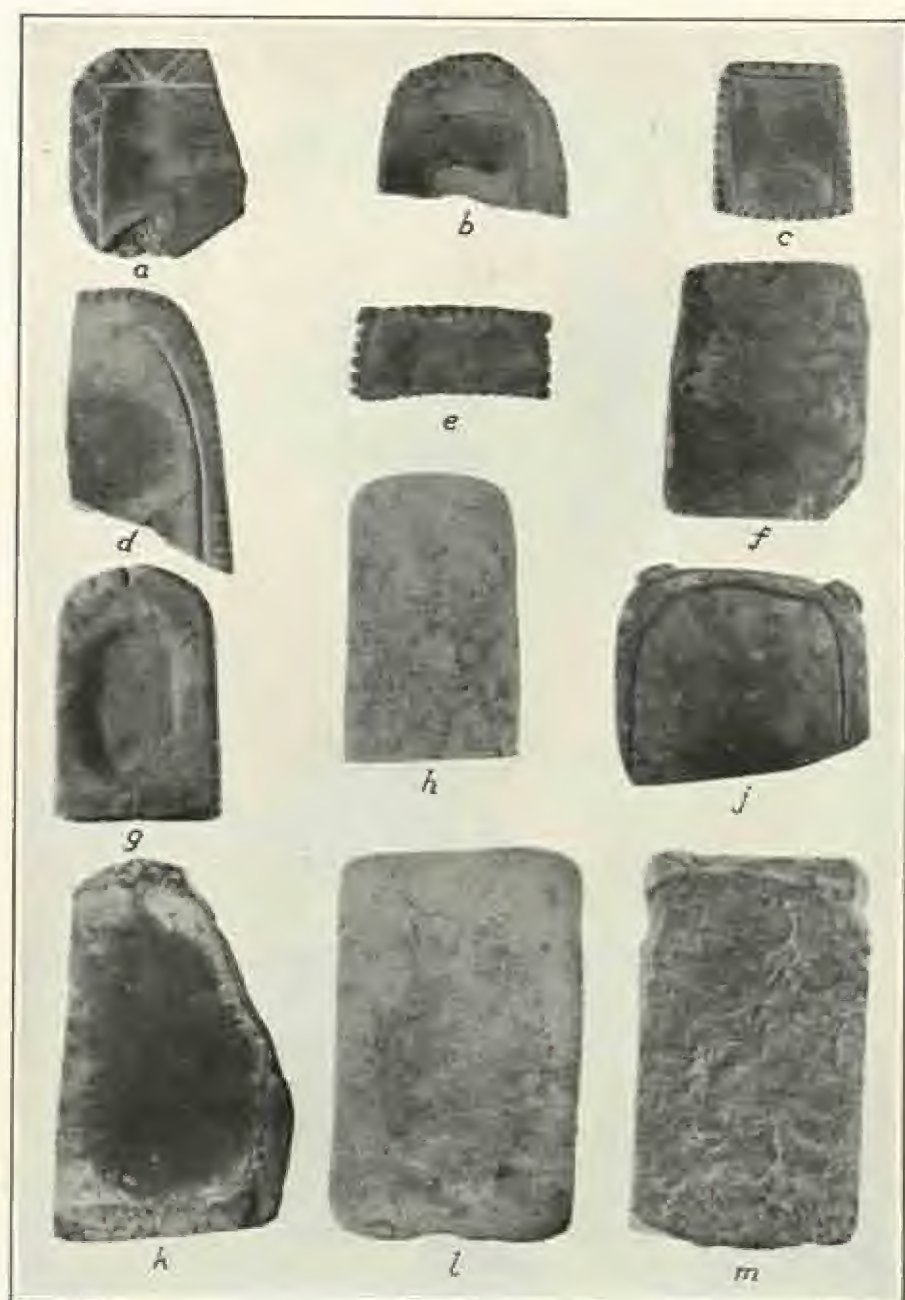
NOTCHED STONE SLABS

The slabs *a-c*, of laminated tuff, are from Old Town Ruin; *d*, of laminated tuff, is from the McSherry Ranch Ruin; *e*, of laminated tuff, from Room 72, Swarts; *f*, of sandstone, from Room 59; *g*, *h*, and *k*, of laminated tuff, from general digging; *j*, of dense sandstone, general digging; *l*, of lava, from Room 53. Specimen *d* is 39 inches long (page 49).



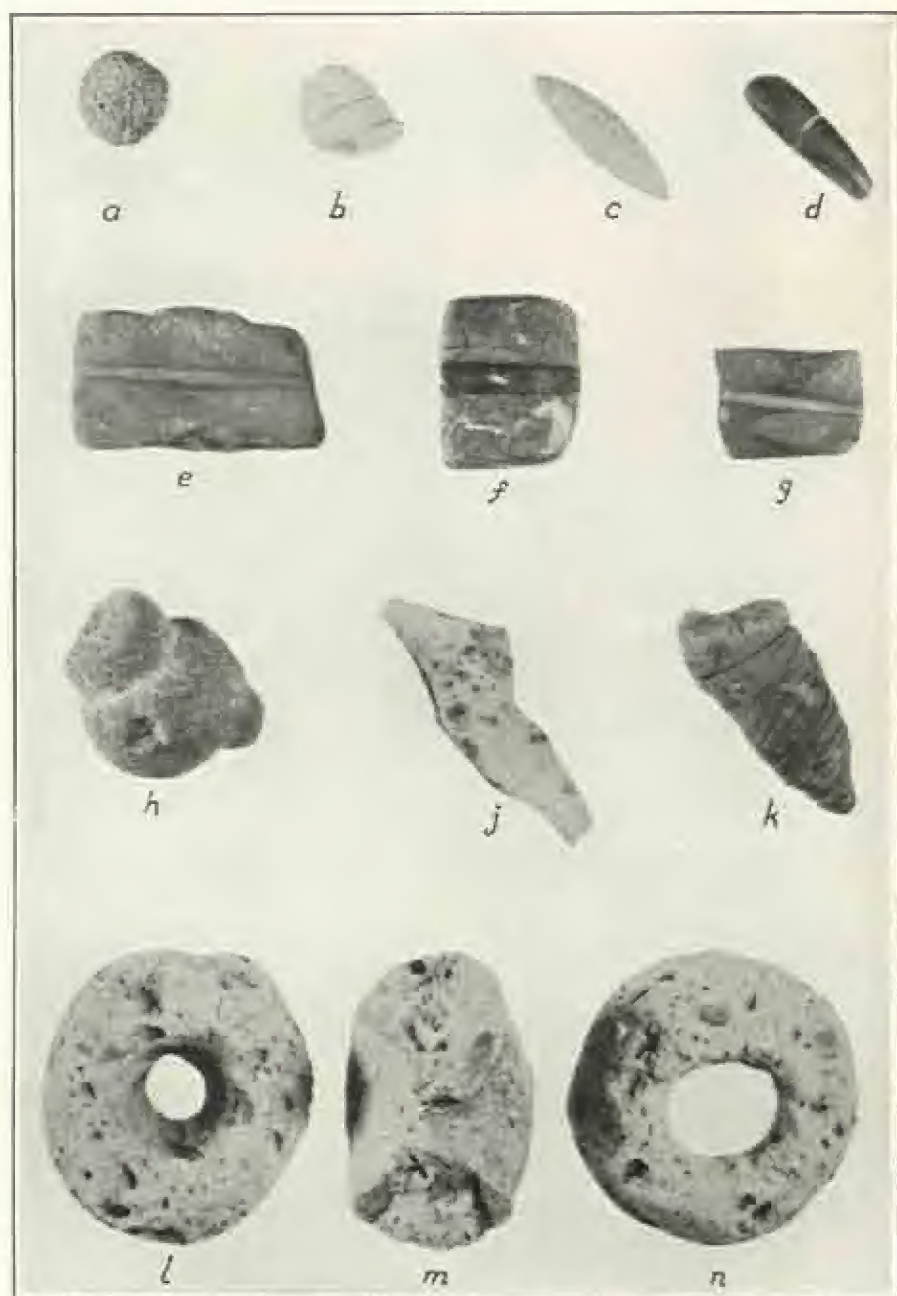
STONE PIPES

The pipe *a*, of sandstone, was found on floor of Room 72; *b*, of sandstone, below floor of Room 81; *c*, of sandstone, from general digging; *d*, of tuff, below floor of Transitional Period Room K. Specimen *a* is 12½ inches long (page 50).



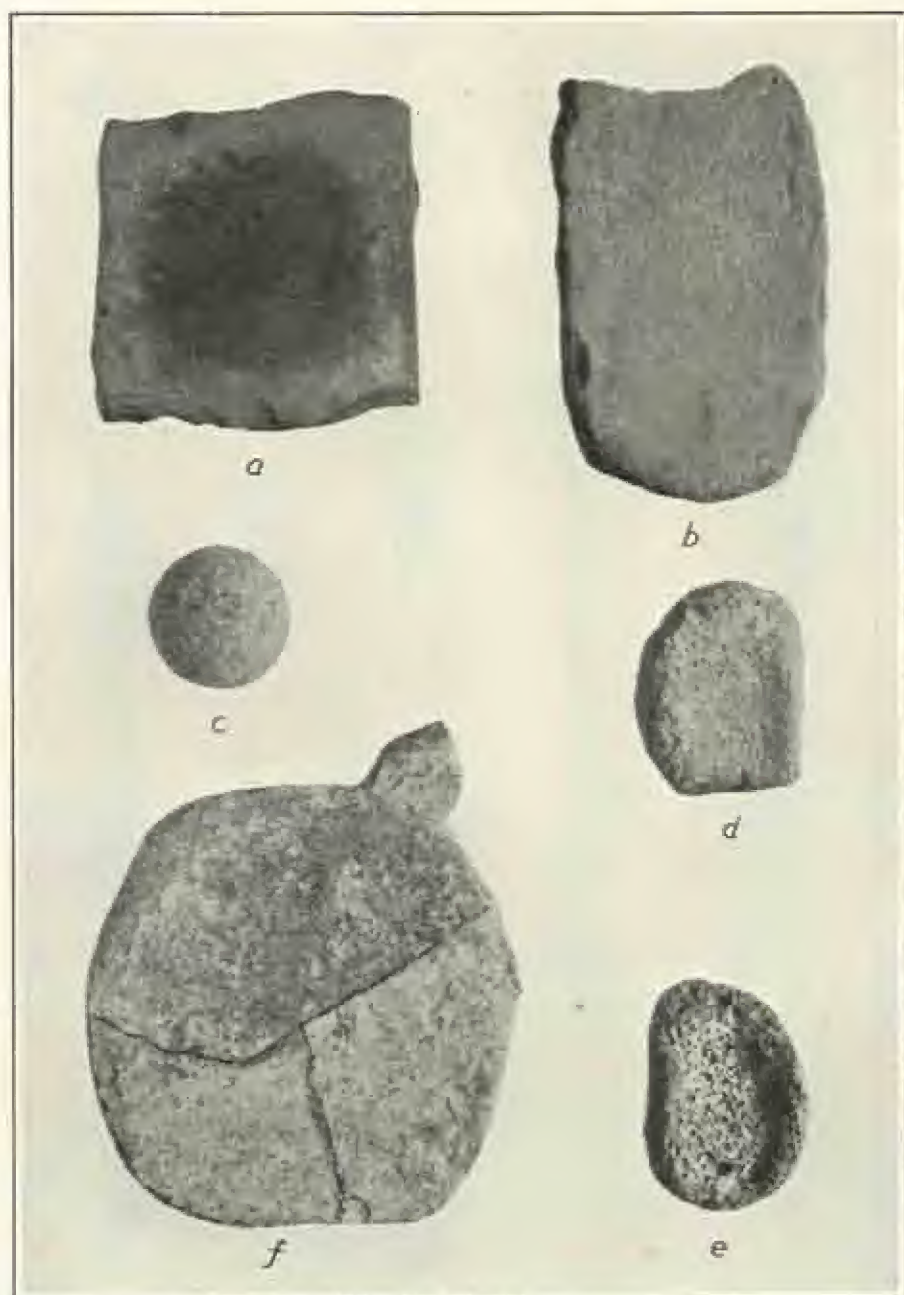
TABLETS OR PLAQUES

The fragment *a* came from below floor of Room 76; *b*, from general digging; *c*, below floor of Room 80; *d*, 2 feet below surface, central plaza; *e*, below floor of Room 102; *f*, below floor Room 100; *g*, N A N Ranch Ruin; *h*, fill of Room 103; *j*, below floor of Room 62; *k*, below floor of Room 10; *l*, with Skeleton 597, Transitional Period Room Y; *m*, on floor of Room 111. Specimen *m* is 3 inches long (page 51)



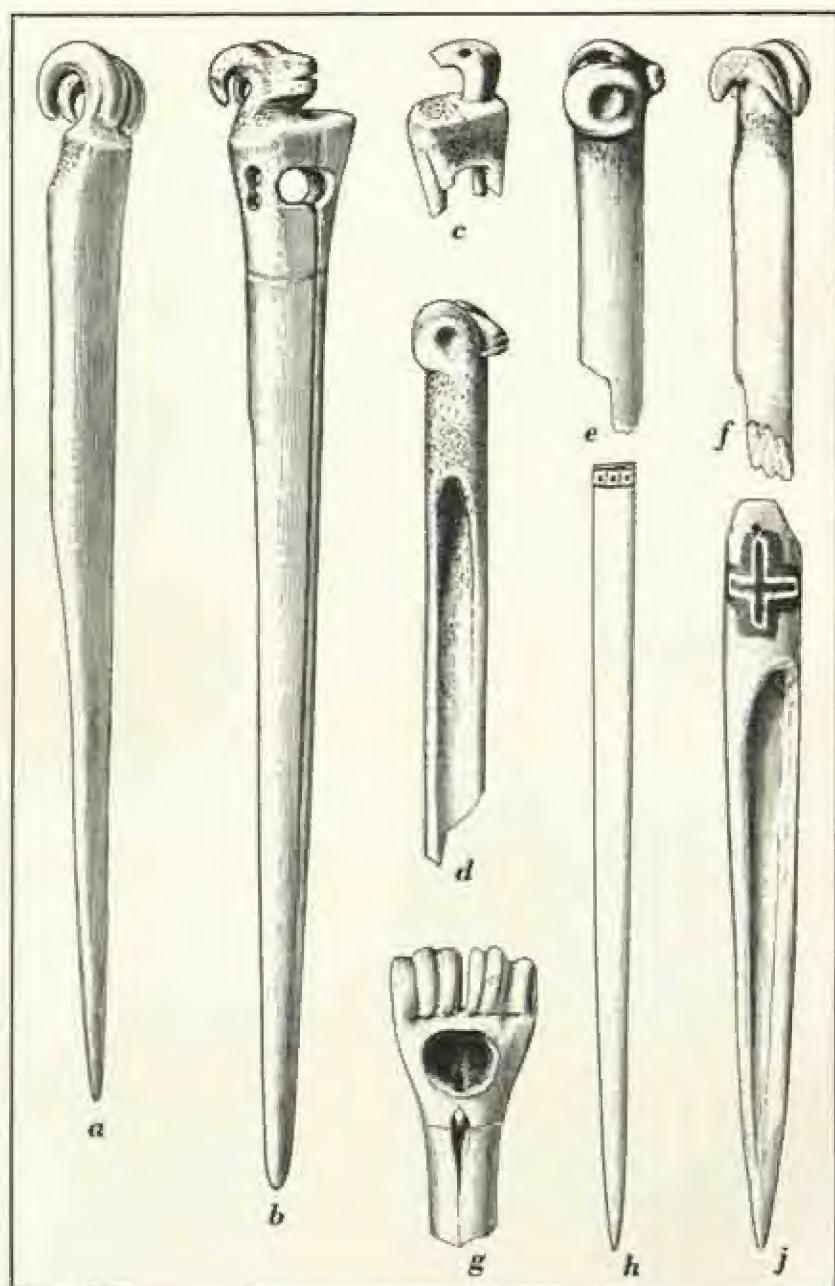
MISCELLANEOUS STONE OBJECTS

The worked stones, *a* and *b*, came from general digging; *c*, from fill of Room 19; *d*, *e*, and *g*, from a cache on floor of Room 5; *f*, from below floor of Room 113; *h*, a bird form, with Skeleton 758, Room 81; *j* and *n*, in fill of plaza; *k*, below floor of Room 63; *i*, below floor of Room 71; *m*, below floor of Room 114. The objects *e* and *f* suggest atlatl stones. Specimen *e* is 3½ inches long (page 54)



MISCELLANEOUS STONE OBJECTS

Specimens *a* and *b*, from general digging, are tentatively identified as bead-reducing and rounding stones; *c*, a stone ball from below floor of Room 78; *d*, in fill of Room 7-13, and *e*, in fill of Room 81, probably were used as pigment mortars; *f*, from below floor of Room 80, suggests a turtle. Specimen *f* is 7 inches in diameter (page 54)



DECORATED BONE AWLS
 Specimen b is 9 inches long (page 57)



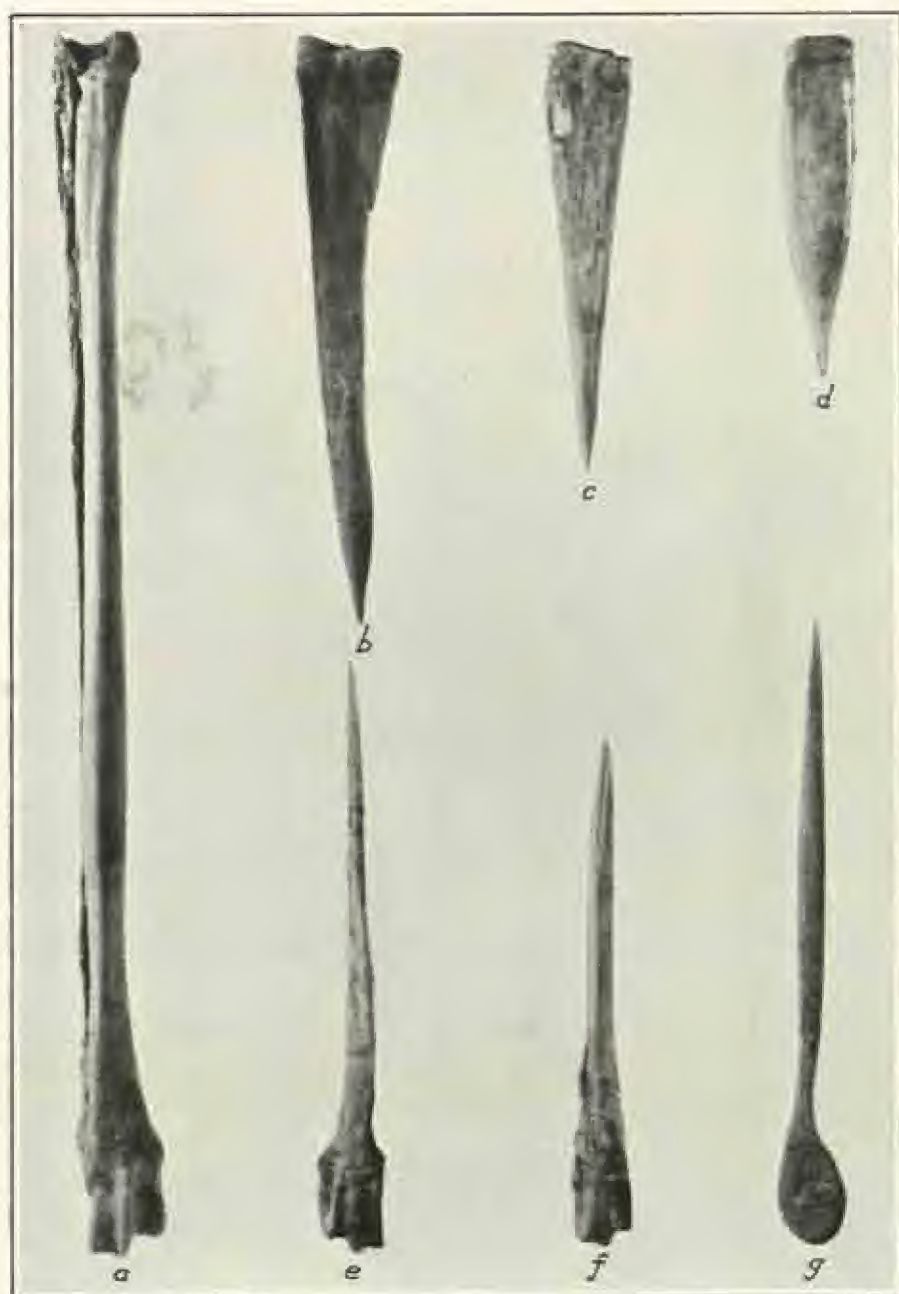
BONE AWLS

Awls made from deer and antelope ulnar. Specimen e is 7½ inches long (page 57)



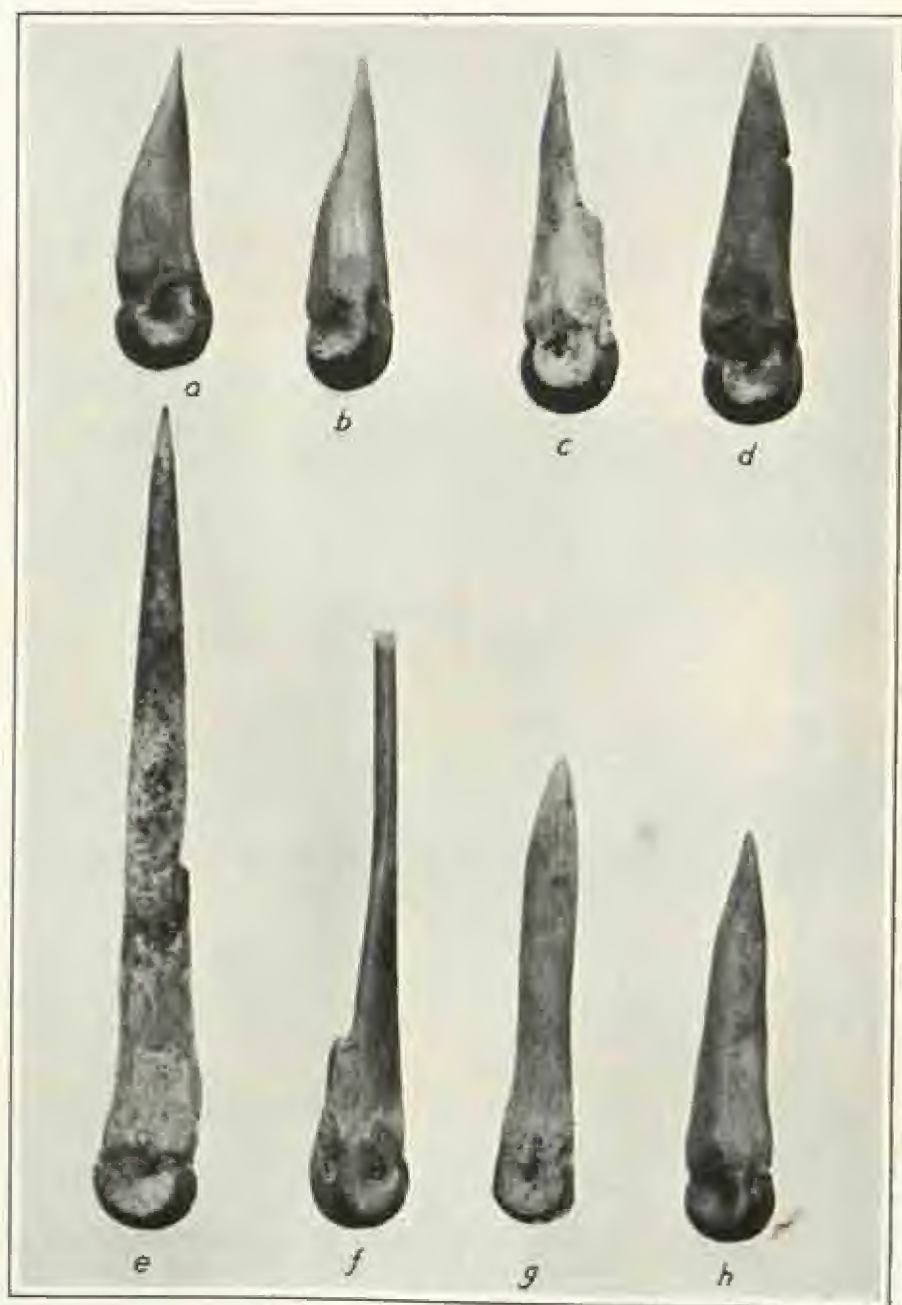
BONE AWLS

Complete metapodial and awls derived from this bone. The bone, *a*, is 10 inches long (page 57)



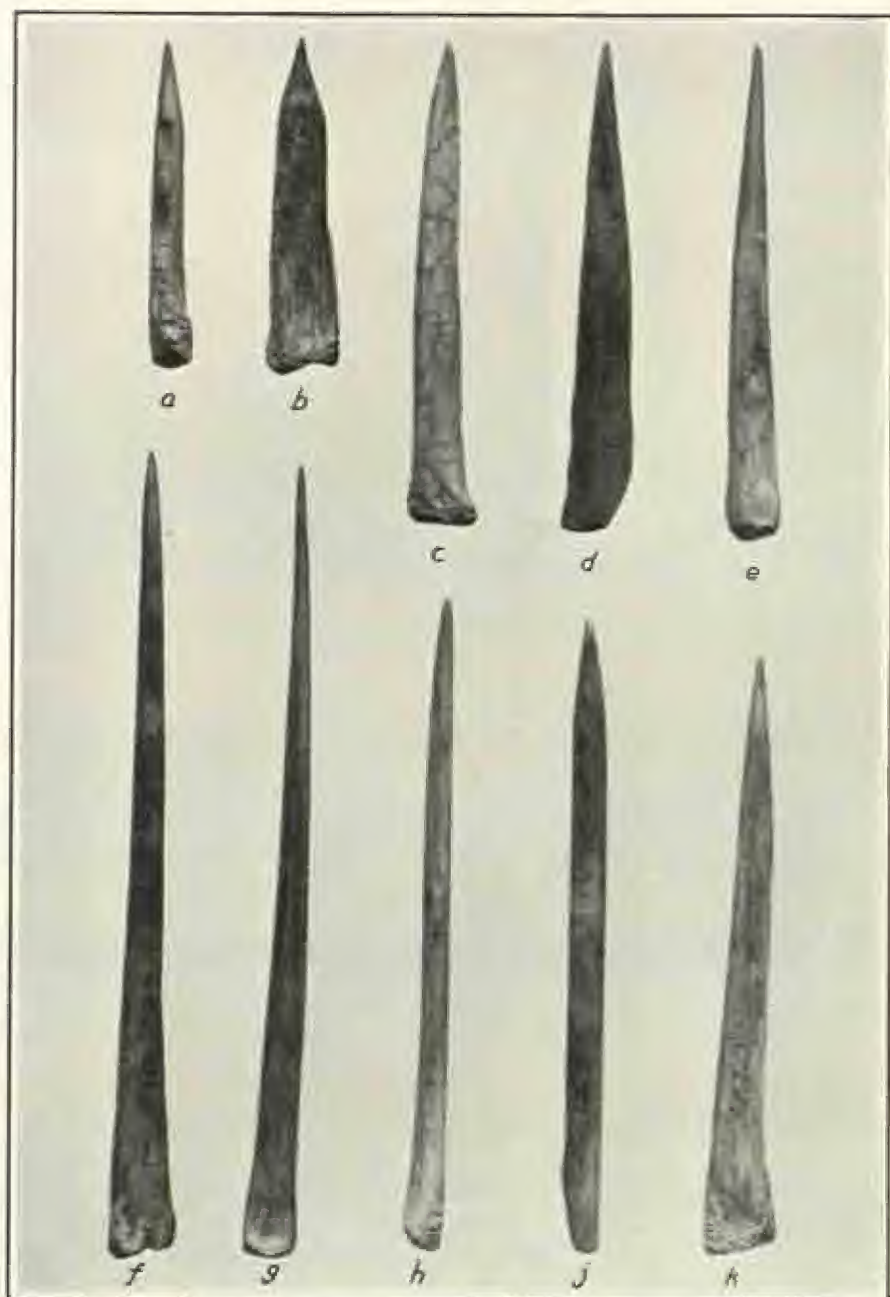
BONE AWLS

Split metapodial awl, raw material, and finished specimens. Specimen *a* is 9½ inches long (page 58)



BONE AWLS

Awls made from distal end of split metapodials. Specimen *e* is 7½ inches long (page 58)



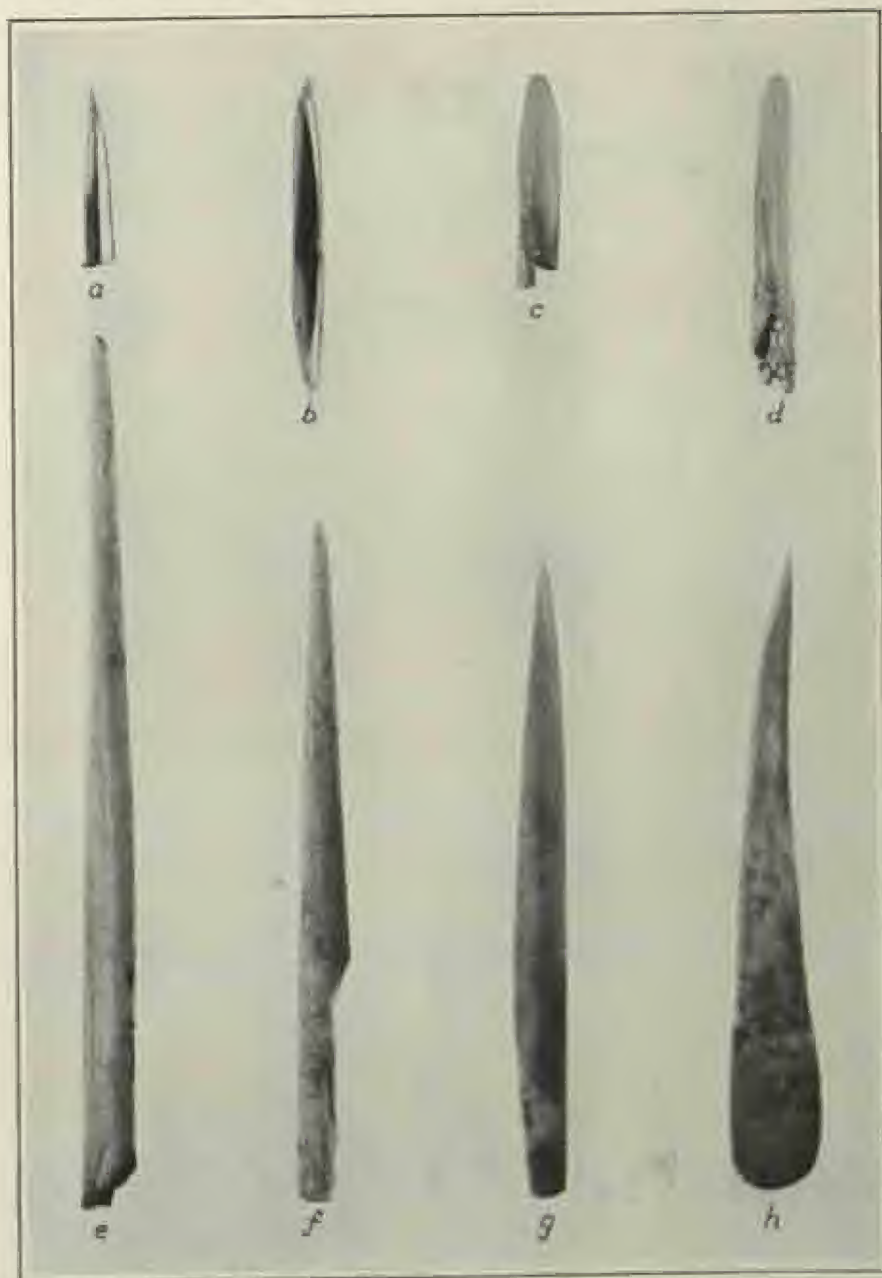
BONE AWLS

Awls made from split bones. Specimen *f* is 7½ inches long (page 58)



BONE AWLS

Awls made from bone splinters. Specimen h is 4 1/2 inches long (page 28)



BONE ARMS AND TONGS

Flattened bone tools and tubular bone awls; a and b, only tools found made from bird bones.

The awl c is $8\frac{1}{2}$ inches long (page 20).

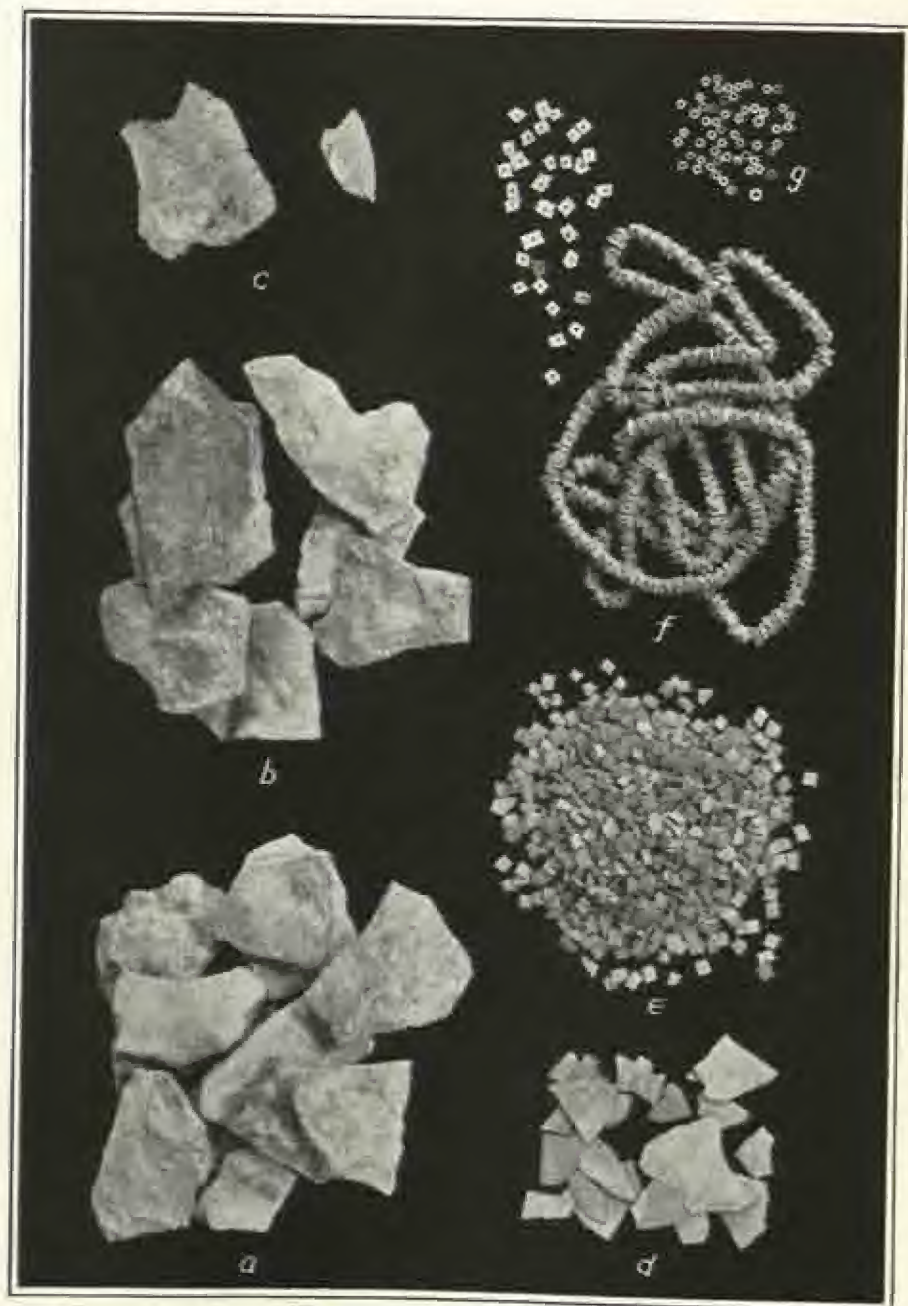


AWIA AND NOTORHO BONNA
Specimen e is 2 inches long (page 56)



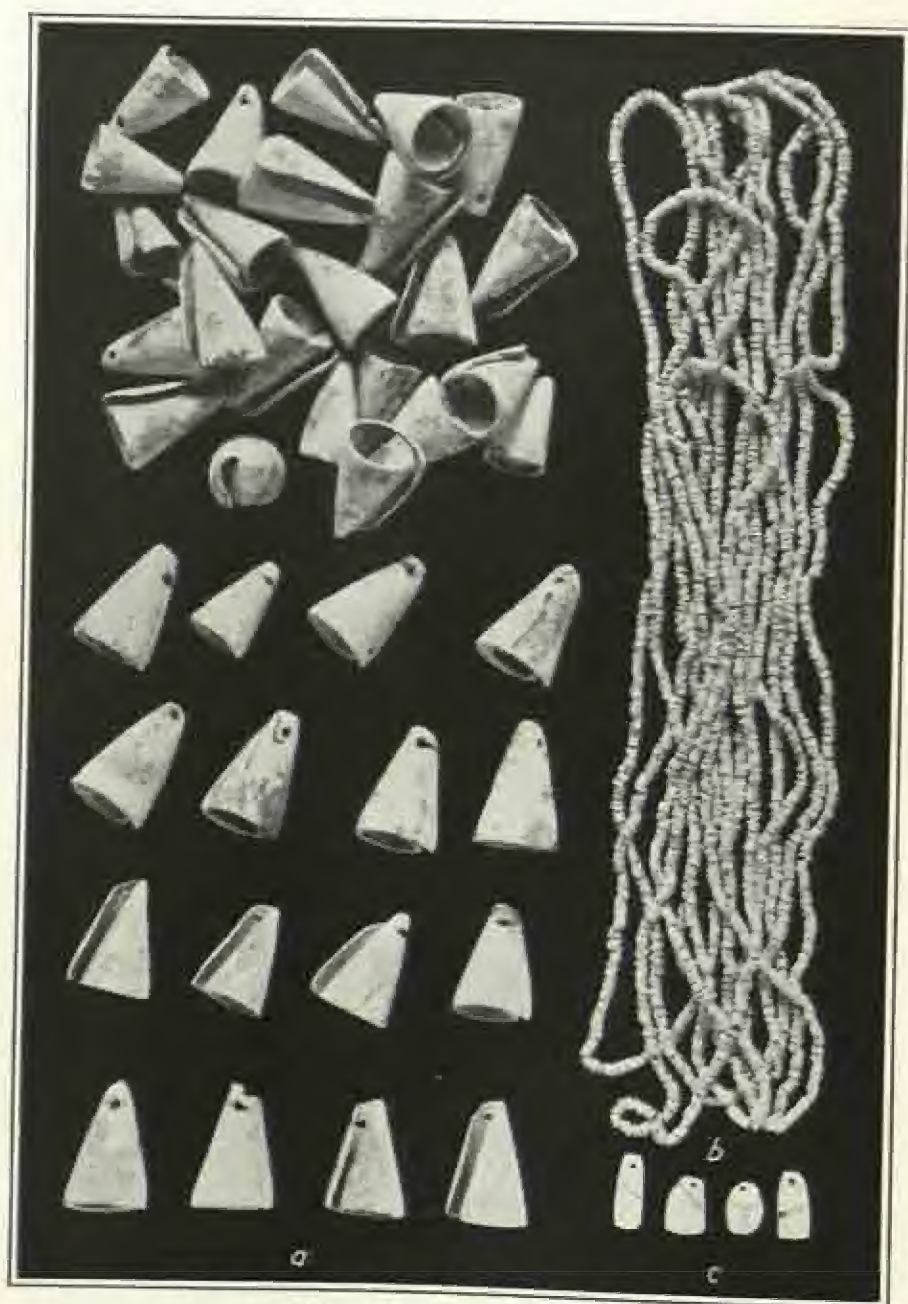
BONE TOOLS

Specimens a-e are flaking tools of heavy bone splinters; f-h are scraping and rubbing tools.
Specimen i is $2\frac{1}{2}$ inches long (pages 59 and 61).



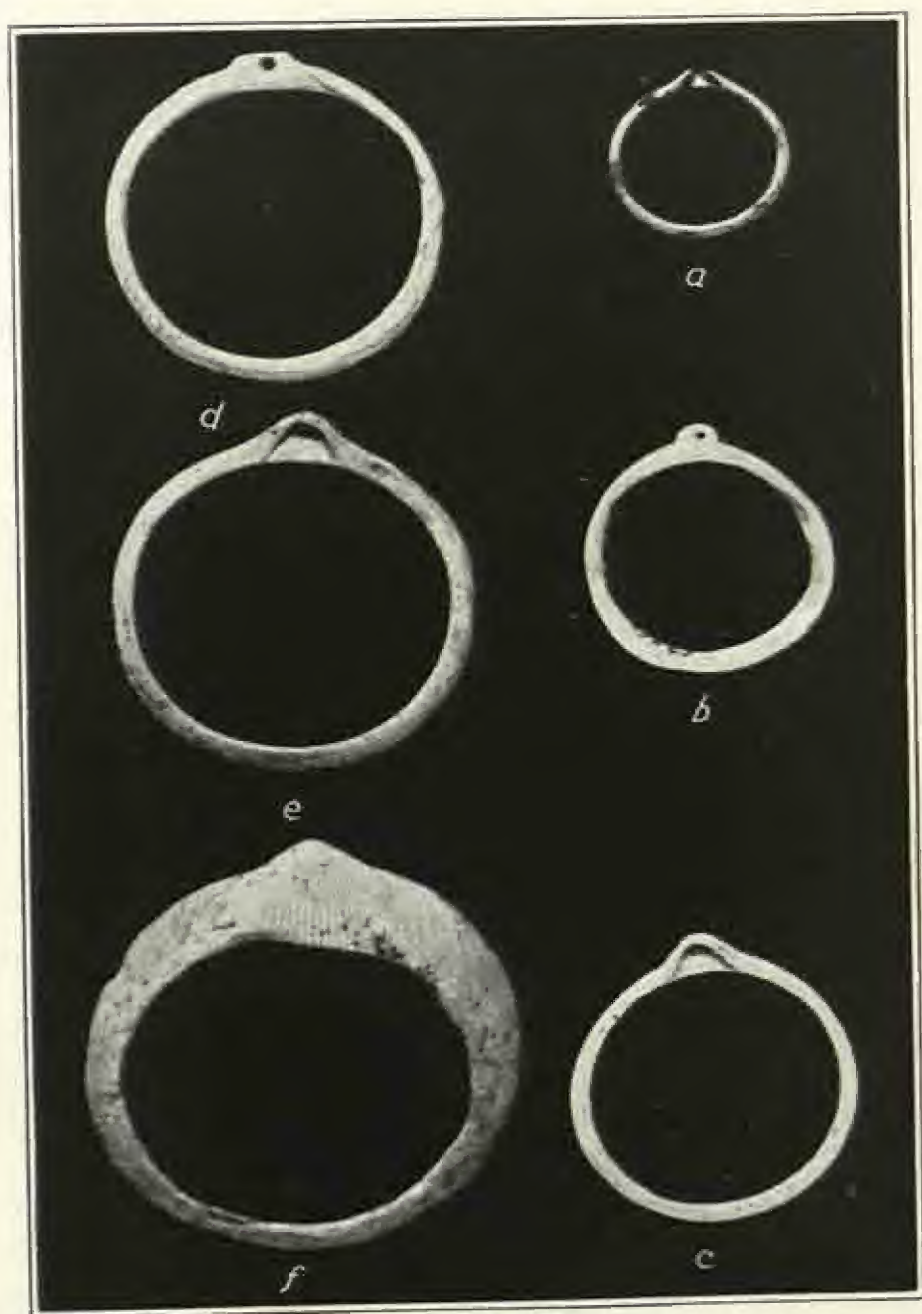
PROCESS OF BEAD MANUFACTURE

This cache was found with Skeleton 901 below floor of Room 38. The pieces of stone in *a* are 2 to 2½ inches long (page 62)



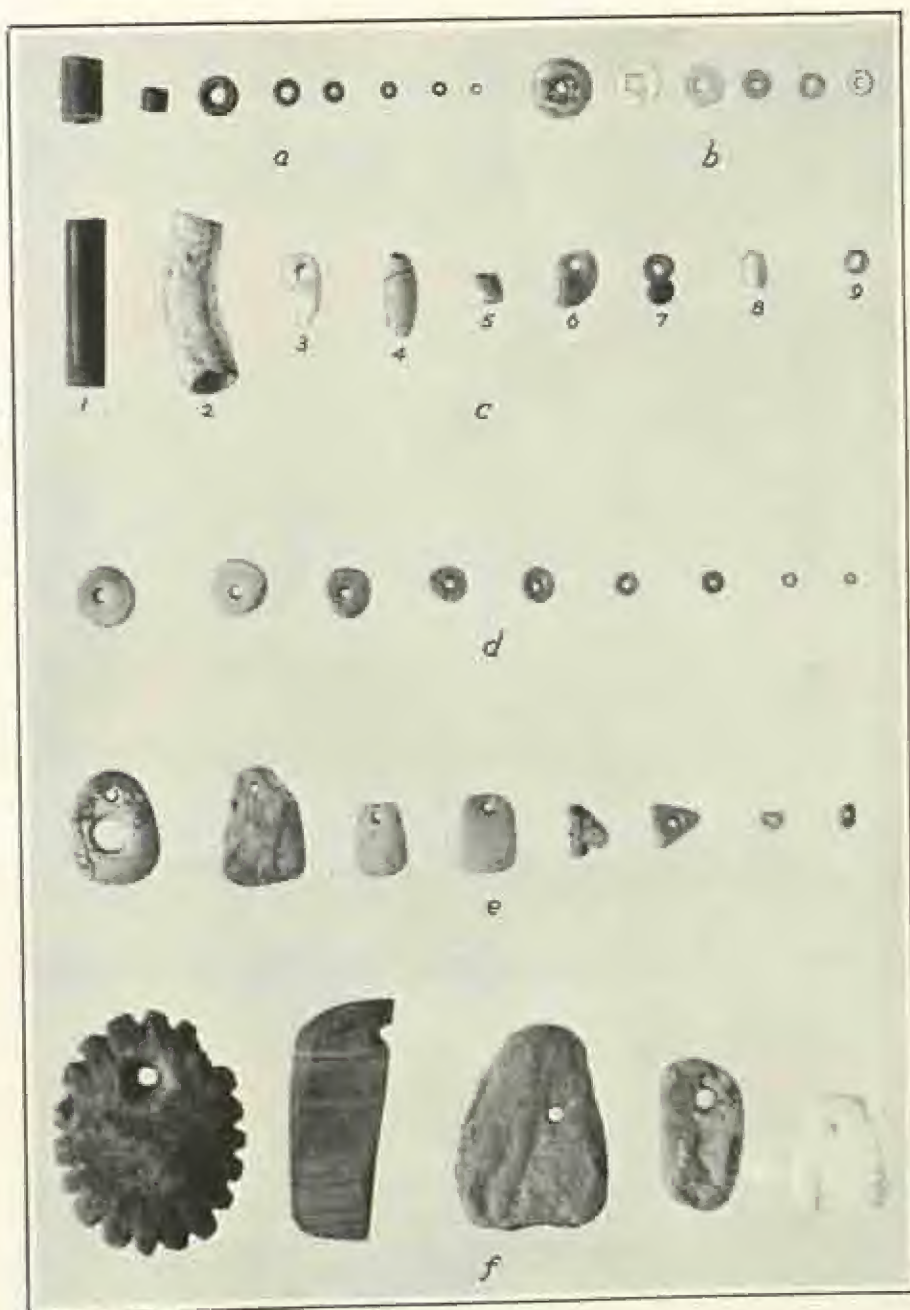
ORNAMENTS FOUND WITH BURIAL 308

Burial 308 below Room B: a, Conus shell tinklers; b, necklace of oval shell beads; c, turquoise pendants. The largest tinkler is 1 1/2 inches long (page 65)



SHELL BRACELETS

Bracelets from *Glipsonia* shell showing variation in size: *a*, with Skeleton 812, Room 84; *b*, with Skeleton 29, Room 4; *c*, with Skeleton 121, Room 19; *d*, with Skeleton 908, Room 100; *e*, among 25 found with Skeleton 389, outside of Room 7-15; *f*, with Skeleton 755, Room 76. Specimen *f* is $3\frac{1}{4}$ inches, outside diameter (page 65)



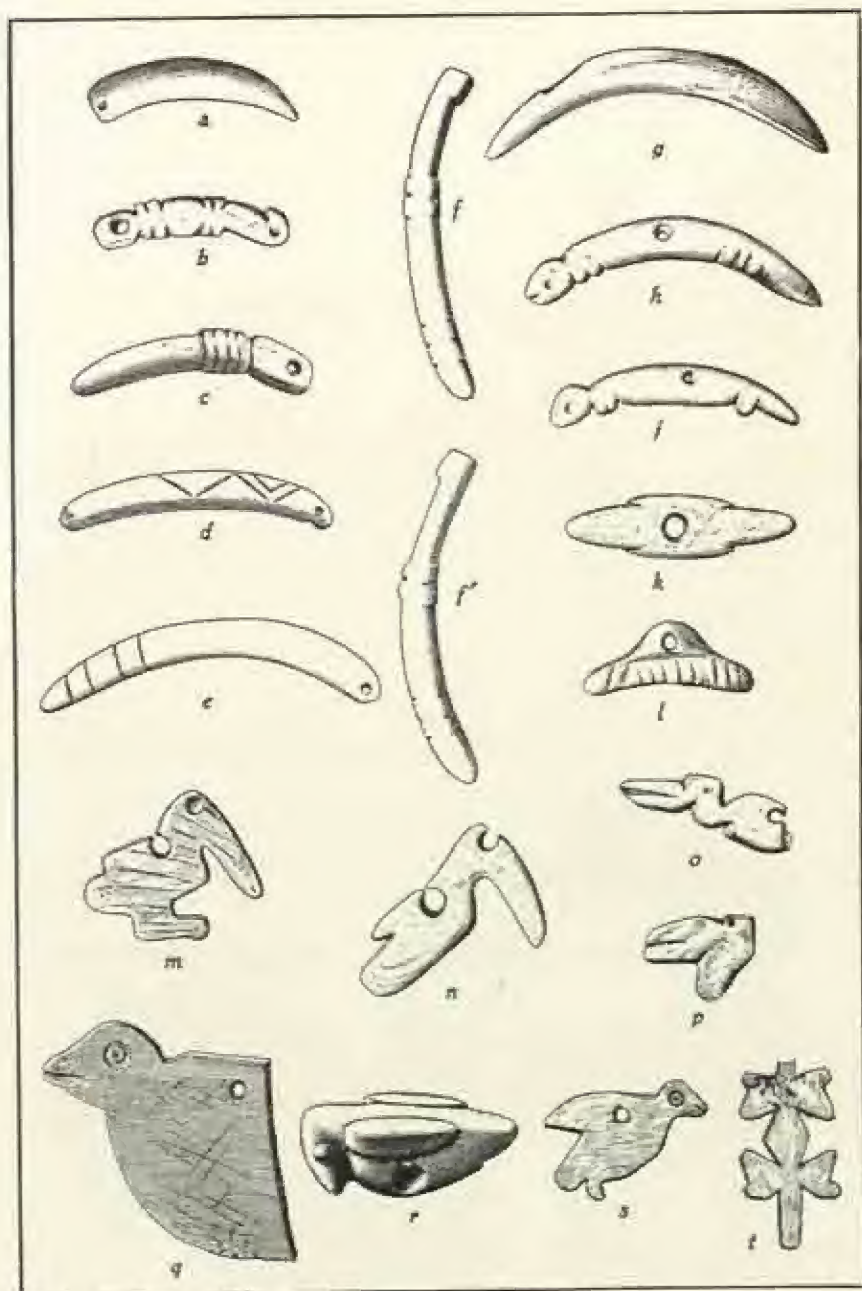
BEADS AND PENDANTS

The series *a* shows dark gray stone beads; *b*, discoidal *Glycymeris* shell beads; *c*, all shell except *c*, 1, which is bone (page 55), and *c*, 2, which is a seed; *d*, turquoise beads; *e*, turquoise pendants; *f*, pendants of various stones. The scallop-edged pendant is 1½ inches long (page 43).



BRACELETS

Glycymeris shell bracelets on the arm bones of Early Period adult skeleton 442, which was found outside Room 2. The large cluster of bracelets still encircling the left arm bones is 5 1/2 inches long (pages 65)



SHELL AND STONE CARVING

Specimens a-f, shell pendants and gorgets; m-p, bird forms cut from shell; g-h, stone birds; i, reptilian form in shell. Specimen q is 2 inches long (pages 29 and 66)

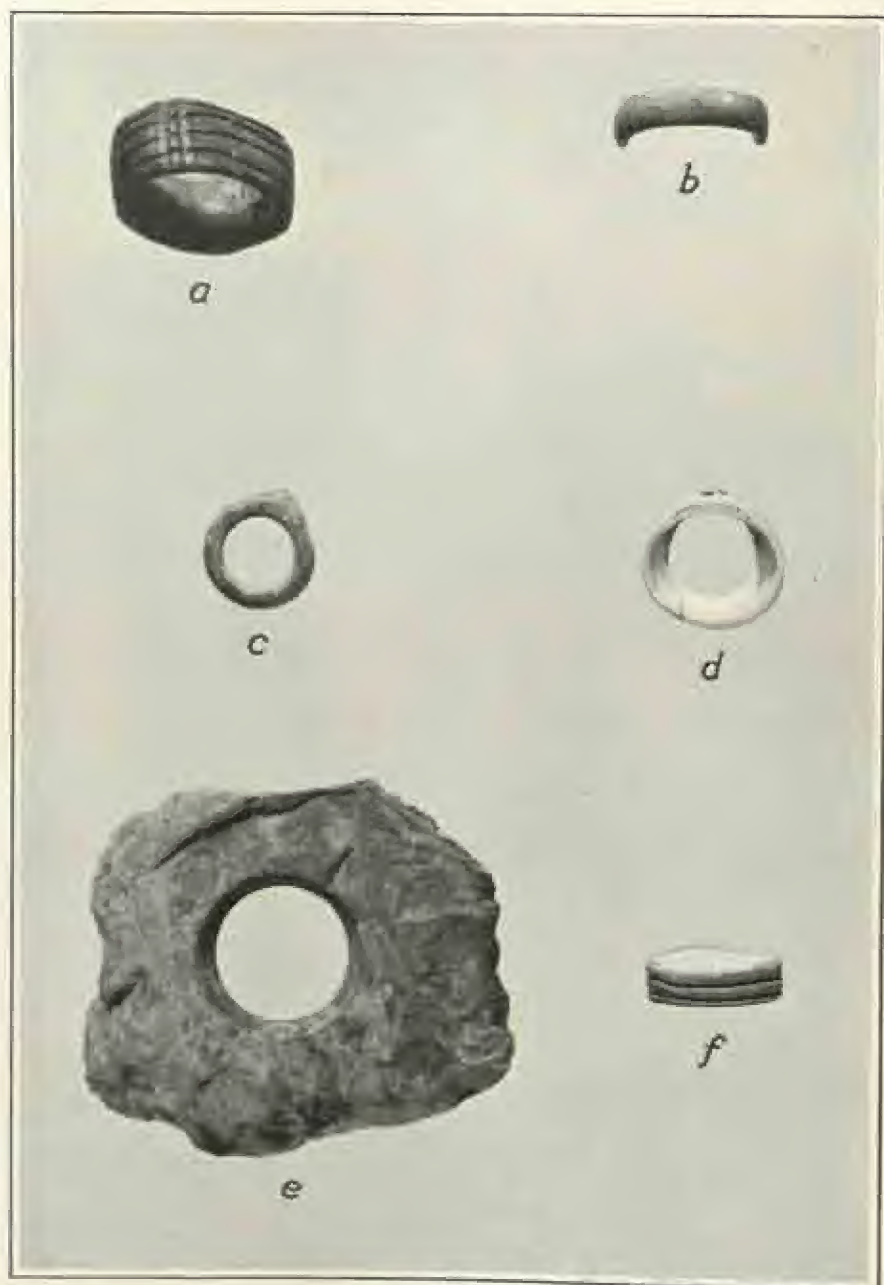
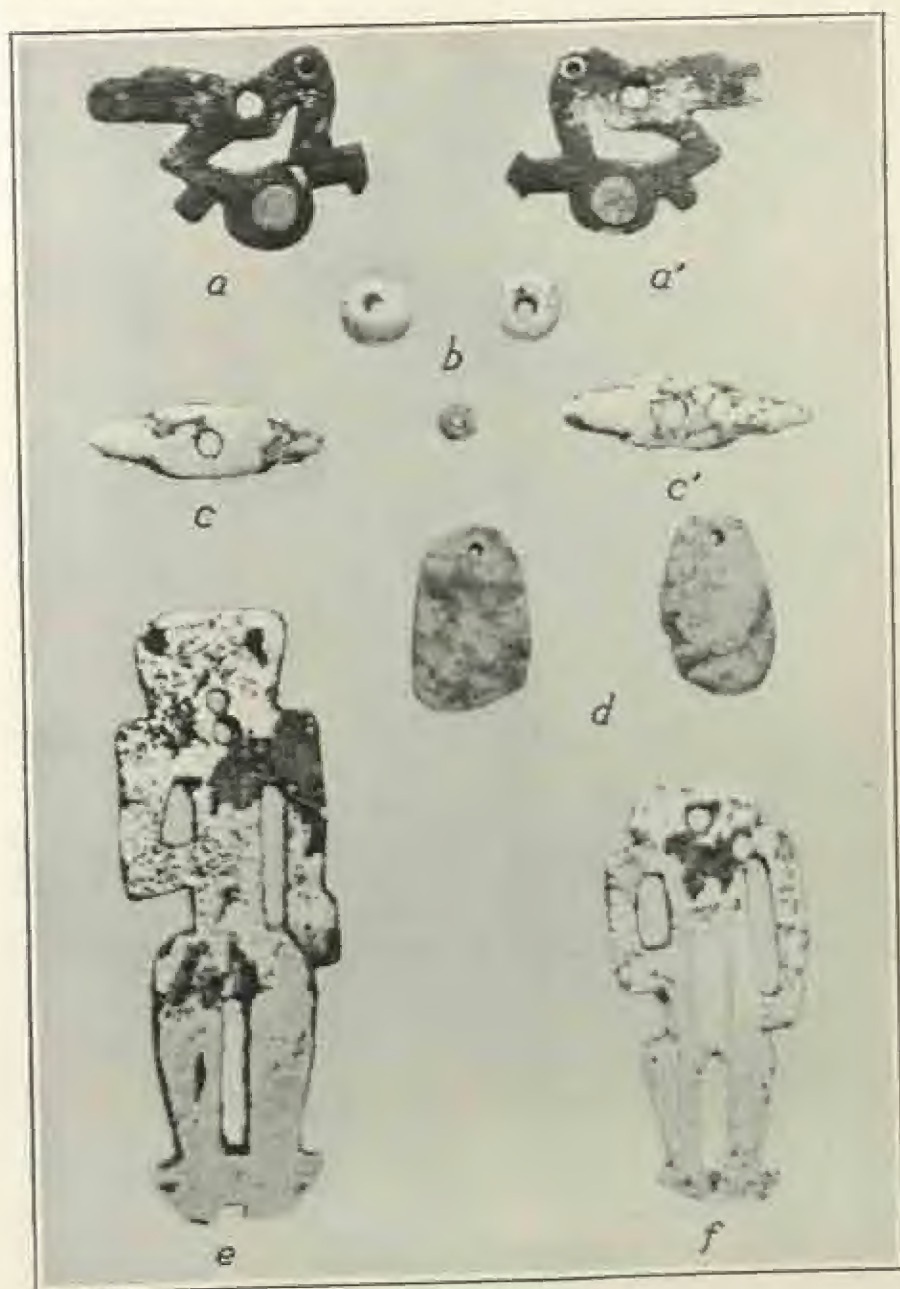


FIGURE RINGS AND EARRINGS

The finger ring *a* was found with Skeleton 299, Room 33; *b*, from general digging; *c*, an imitation of a shell, with Skeleton 633, Room 68A; *d*, like *c*, usable as finger ring or earring, with Skeleton 29, Room 4; *e*, ring in process of manufacture, below floor of Room 100; *f*, from general digging. All are of stone except *a* and *b*, of bone, and *d*, of shell. Specimen *e* is 2½ inches long (page 67).



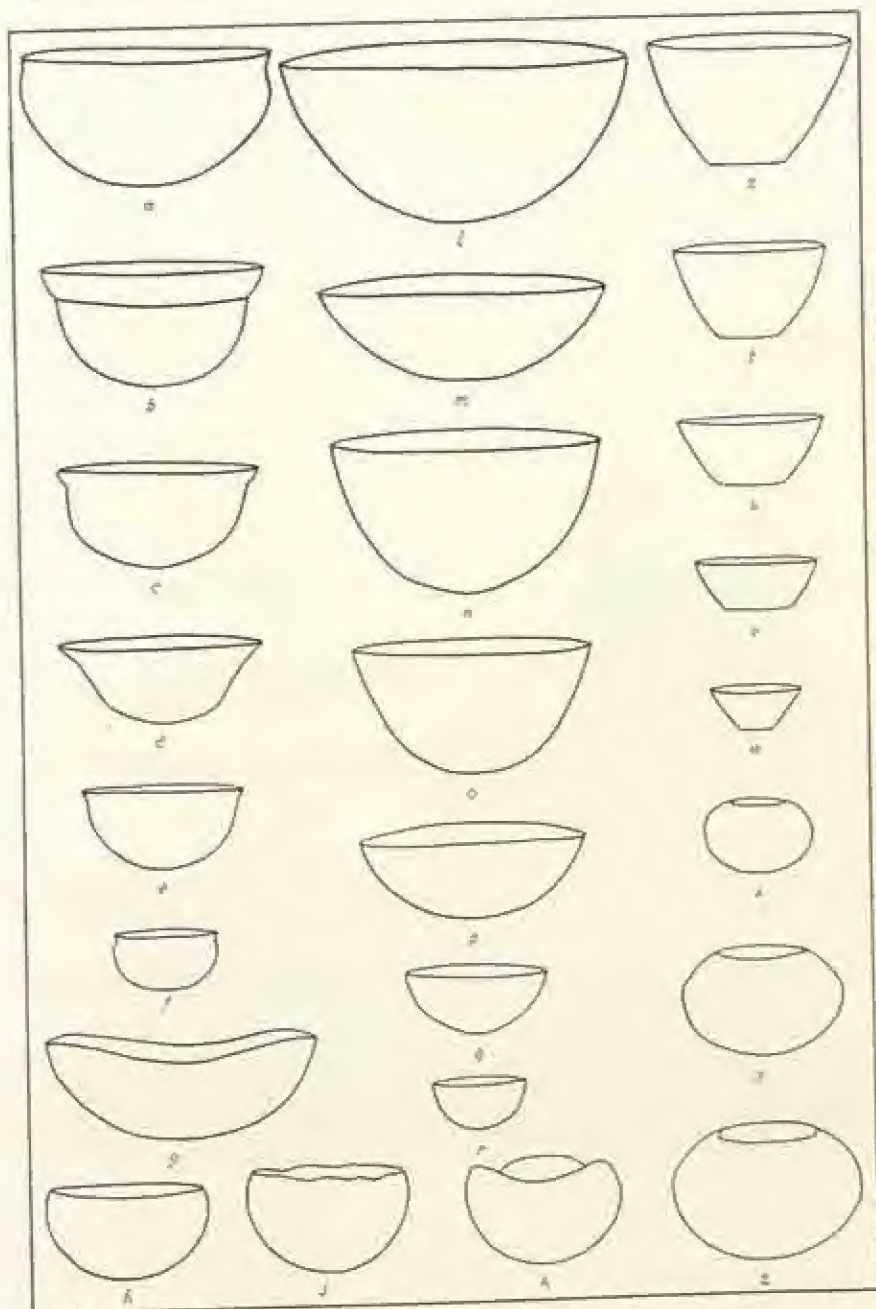
SHELL AND TURQUOISE

Objects of carved shell and turquoise, from a Minahasa ruin near Suar. Specimen *e* is 3 1/2 inches long (page 67).



MEDICINE MAN'S CACHE

Cache of a bowl and its contents from Anasetha Canyon, 12 miles north of the Swarts Run; a, bowl which contained the objects; b, *Abietis* shell beads; c, cut *Olivella* shell beads; d, stalactite fragments; e, malachite pendant; f, pieces of yellow oxide; g, shell bracelet fragments; h, quartz crystal; i, lead ore crystals; k, points of agate, flint, and obsidian. The stalactite fragment, d, is 3½ inches long; the bowl is 6½ inches in diameter, reduced on the plate (page 67)



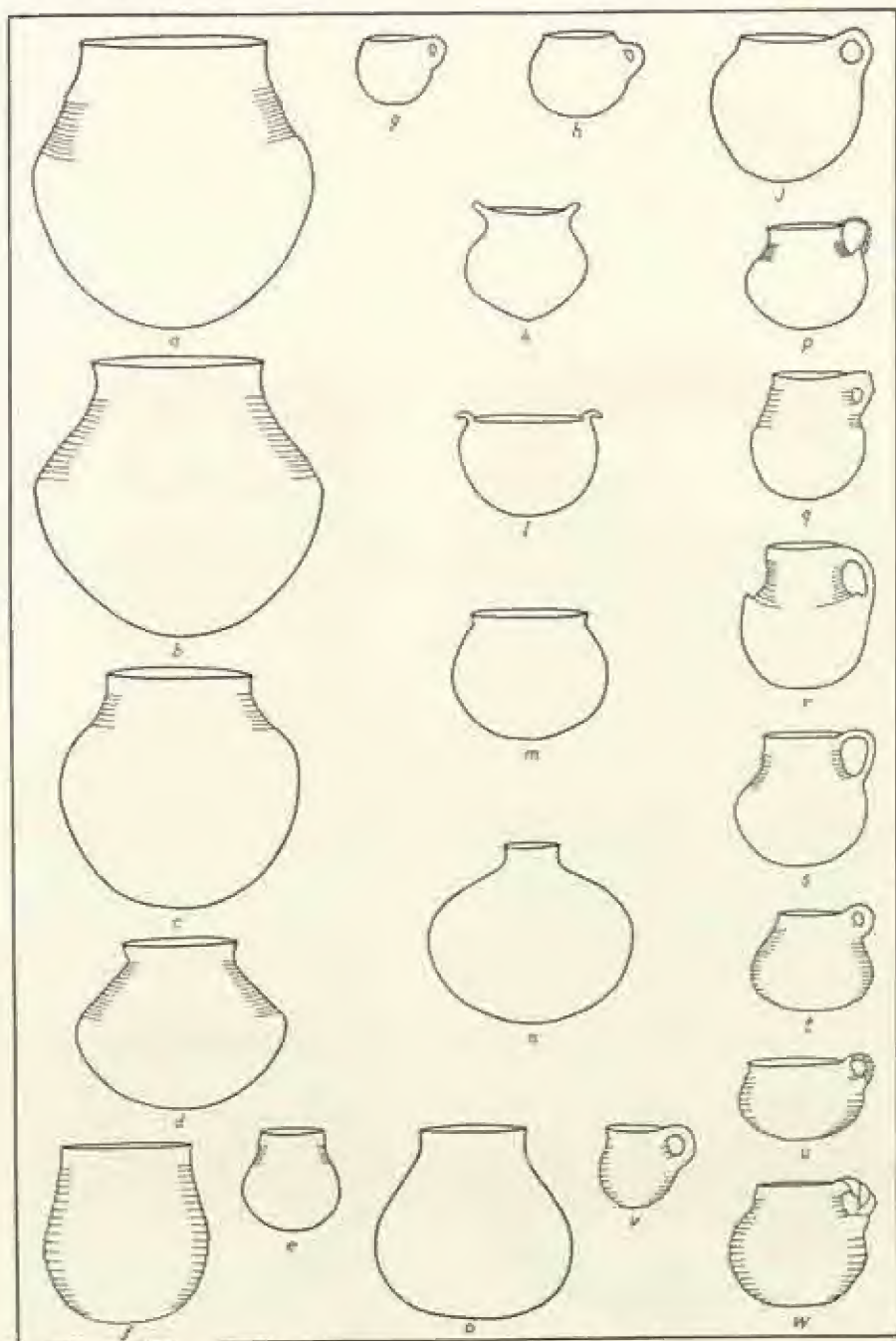
MINIBRES BOWLS

Variations in size and form of Minibres bowls: a-f, flared rims; g, elliptical; h-k, incurved at top, some with waved edge; l-o, regulation Minibres bowl forms; s-w, flower pot shapes; x-z, aced bowl outlines. The outline *l* is 13½ inches in diameter (page 73)



MIMBRES BLACK-ON-WHITE OLLAS

Variations in size and form of Mimbres black-on-white decorated ollas. The olla *k* is 13½ inches in diameter (page 75)



MINIBRES OLLAS, POTS, AND JUGS

Variation in size and form of Minibres ollas, pots, and jugs: a-e, ollas with corrugated neck and plain body; f, all-over corrugated olla; m-o, plain ollas; A and i, pots with hooks at rim; s-f, plain ware jugs; p-s, corrugated neck jugs; t-w, all-over corrugated jugs. The olla a is 17 inches high



MIMBRES CLASSIC BLACK-ON-WHITE BOWLS

Bowls were built up with ropes of clay as shown in *e*. The same technique appears in *h*, where spiral fractures followed the juncture of the erased coils at the time of sacrificing the bowl. The bowl *d* is 12½ inches in diameter (page 73)



MISKITO CLASSIC BLACK-ON-WHITE BOWLS

The design on *f*, one of the few unglazed bowls found, is extremely delicate and shows exceptional restraint by the artist. The bowl *d* is 11½ inches in diameter (page 72)



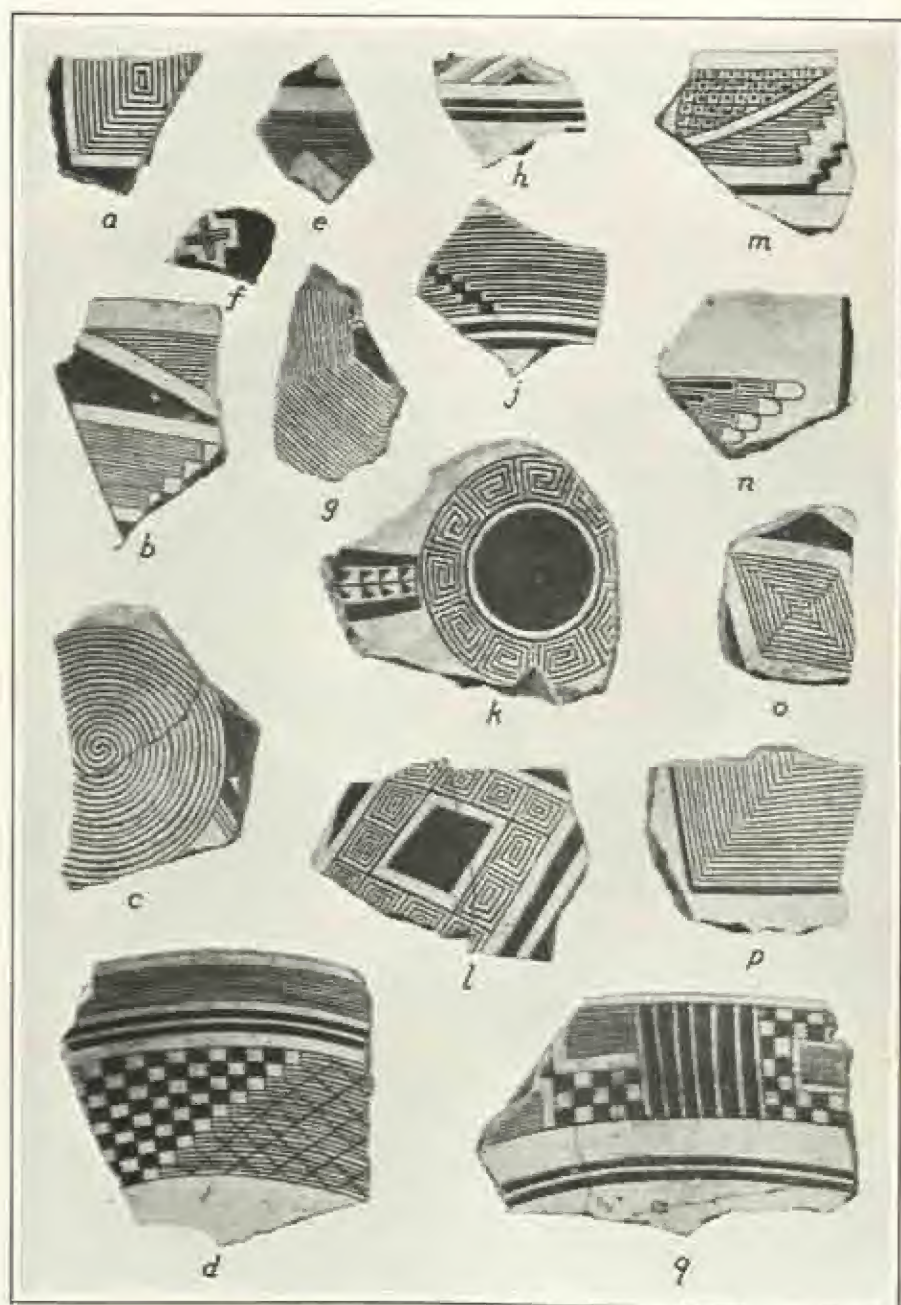
MIMBRES CLASSIC BLACK-ON-WHITE VESSELS

The uncommon elliptically formed bowl, *a*, has a slightly wavy rim edge; *b* is an ordinary bowl with sides compressed to produce a semi-bulge; *c* (Mimbres Bold-face), true half-gourd ladle form; *e*, so-called flowerpot shape; *f*, flare-rimmed bowl; *g*, seed bowl; *h*, large size olla, possibly a water container. The use of small ollas, similar to *h*, is uncertain. The olla *d* is 13 inches in diameter (page 72).



LIFE FORMS ON MINNESOTA CLASSIC BLACK-ON-WHITE POTTERY

These examples show that the practice of killing bowls often destroyed beautiful designs. The bowl *d* is 12 1/4 inches in diameter (page 72)



FINE-LINE BRUSH WORK

Examples of fine-line brushwork on Mimbres Classic Black-on-white pottery. The sherd q is 4½ inches long (page 73)



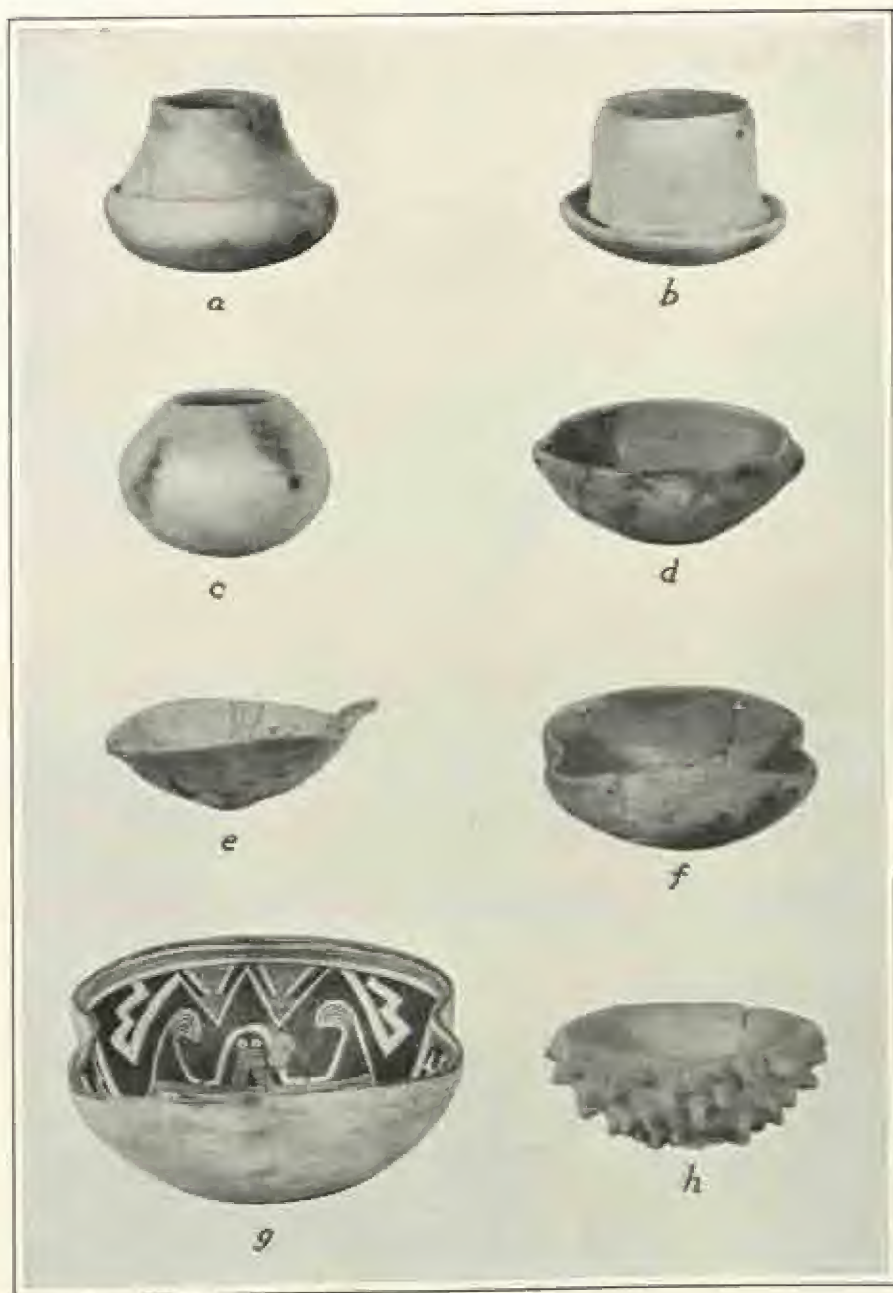
MIMMER BOLD-FACE BLACK-ON-WHITE POTTERY

The cactus (?) design on the bowl *h* in this ware is one of many variations of this figure. Specimen *j* is 12 inches in diameter (page 76).



EFFIGY JARS

Effigy jars are rare in the Mimbre area. Specimens *a-g* are typically Mimbres in paste and decoration; *h-i*, imitations of northern pottery found in Late rooms at Swarts; *a, b, d, e*, and *f*, found buried in a plaza area; *c*, over the body of Skeleton 633, Room 98; *g*, in fill of Room 24. Specimen *f* is 13½ inches from nose to tip of tail (page 75).



CHUMASH BOWLS

These are so named because of the unusual form which suggests such usage; a-d are perforated for suspension. The bowl g is 7 1/2 inches long (page 85)



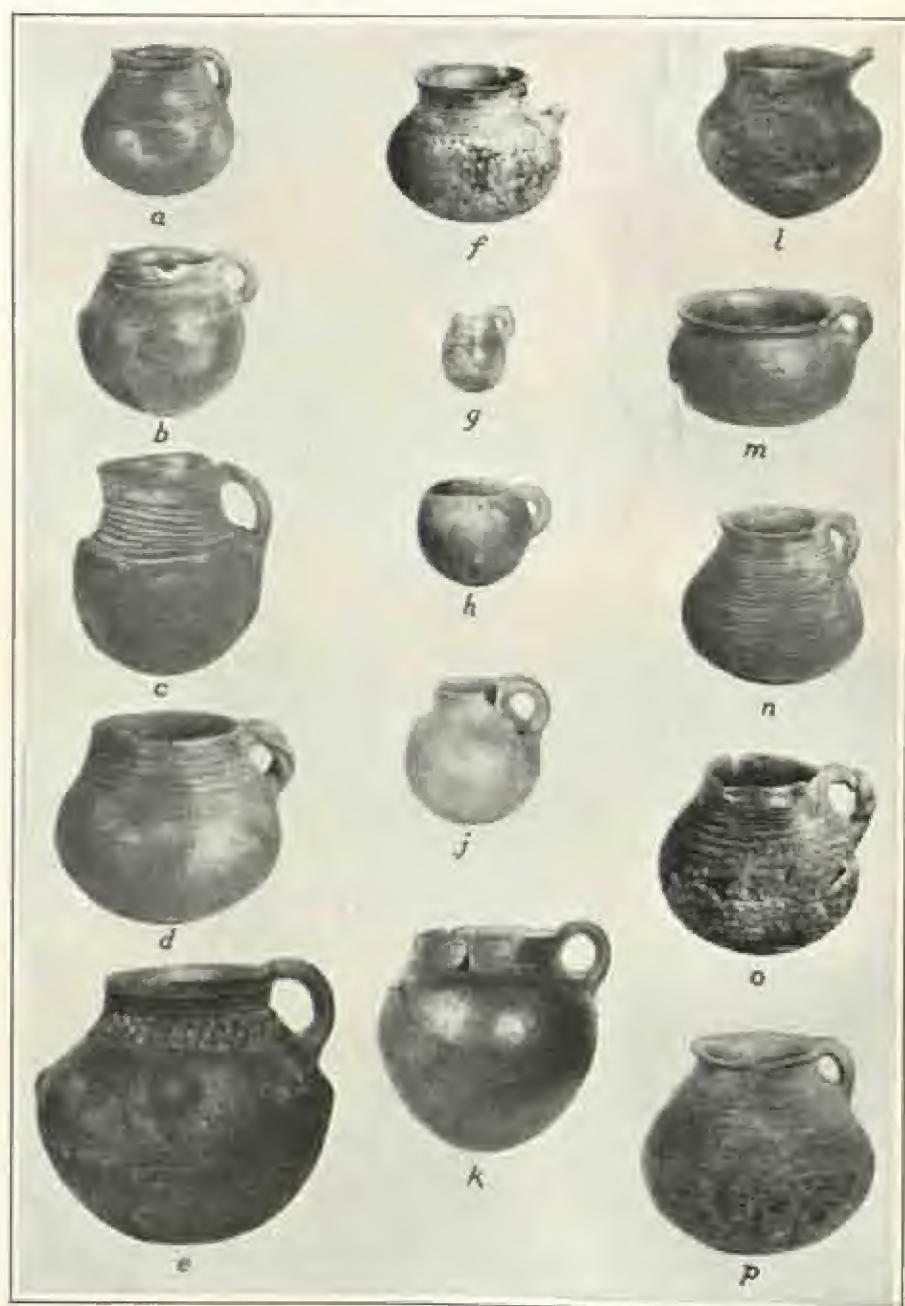
MINIATURE VESSELS

Miniature vessels of red and brown wares; a, incised bowl; b-d, plain ollas; e and j-m, bowls (b-m well polished, walls of $\frac{1}{8}$ of an inch thick); double bowl, f, from another Minibon ruin, similar to fragment g from Swarte; k, unusual form. The bowl m is 3 inches in diameter (page 81)



CULINARY VESSELS

Mimbres red and brown culinary vessels: *a* and *b*, plain brown bowls; *c*, polished red-wash bowl; *d*, rounded piece of lava in bottom of large olla, cached below floor of Room 66 (stones were probably heated to parch dry substances or boil liquids in the vessel (page 5)); *e-f*, plain and spiral-rub seed bowls; *g*, pot with striated surface, hooks at rim; *h*, corrugated bowl, red brown paste; *j*, incised red paste bowl; *k-k'*, spiral-rub bowl. An unusual method of rubbing or creasing the outer surface from base to rim produces a spiral effect, as seen on *h* and *k'*, also on the seed bowl *j*. Specimen *d* is 10 inches in diameter (page 70)



MINUSWA JUGS

Specimens a-f have corrugated necks and plain bodies; g-k, plain, unstipped brown ware, some well smoothed; f and l, ornamented with stick marks; m-p, incised and smooth to rough all-over corrugated jugs. The jug e is 8 inches in diameter (pages 81, 83, and 84)



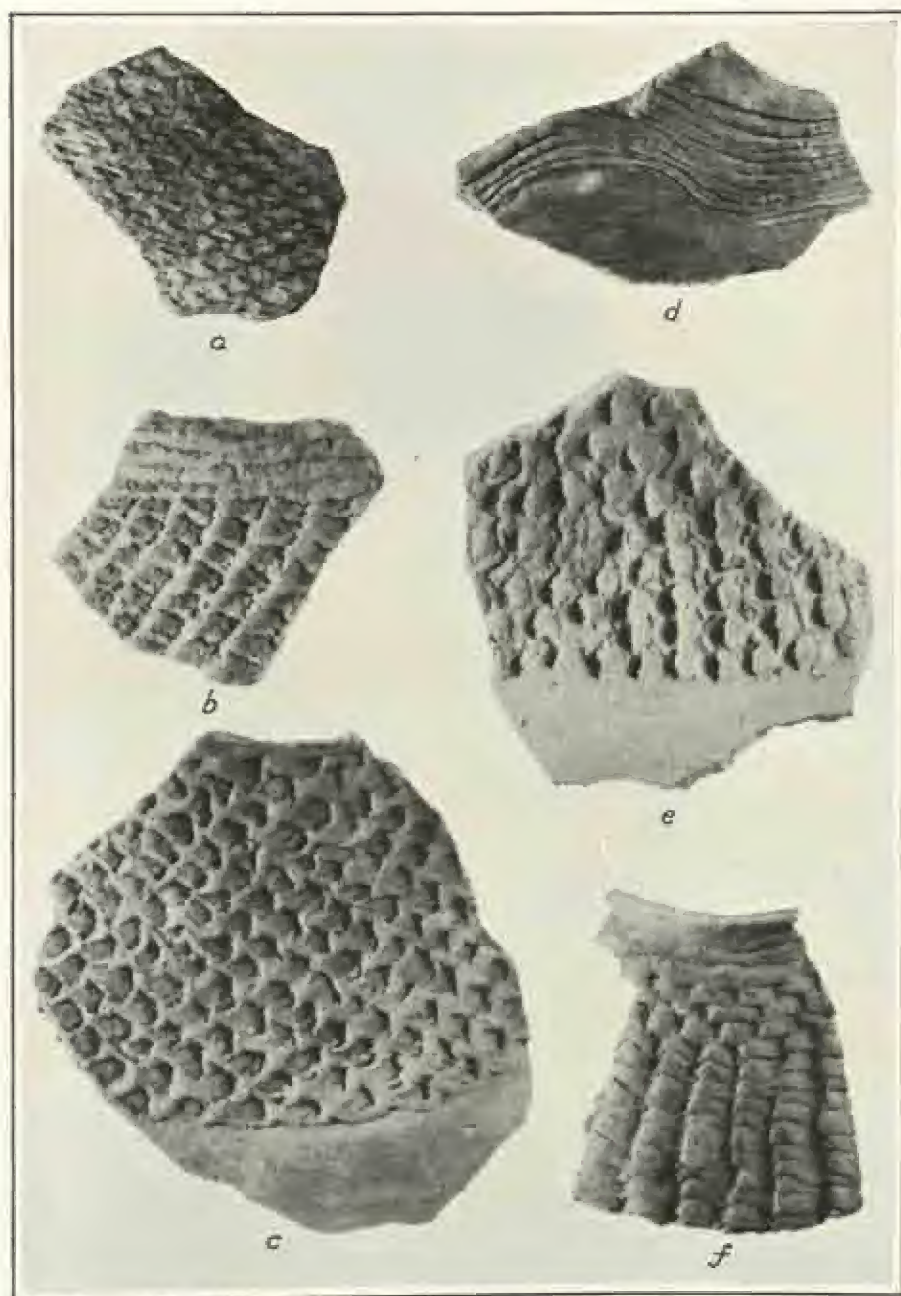
MINNESOTA OLLAR

Incised ollars of polished red ware, *e-g*, are very scarce and no complete specimens were found at Swarta. All-over corrugated ollars, similar to *k*, are also uncommon. Diameter of *m*, 17 inches (pages 80, and 82-84)



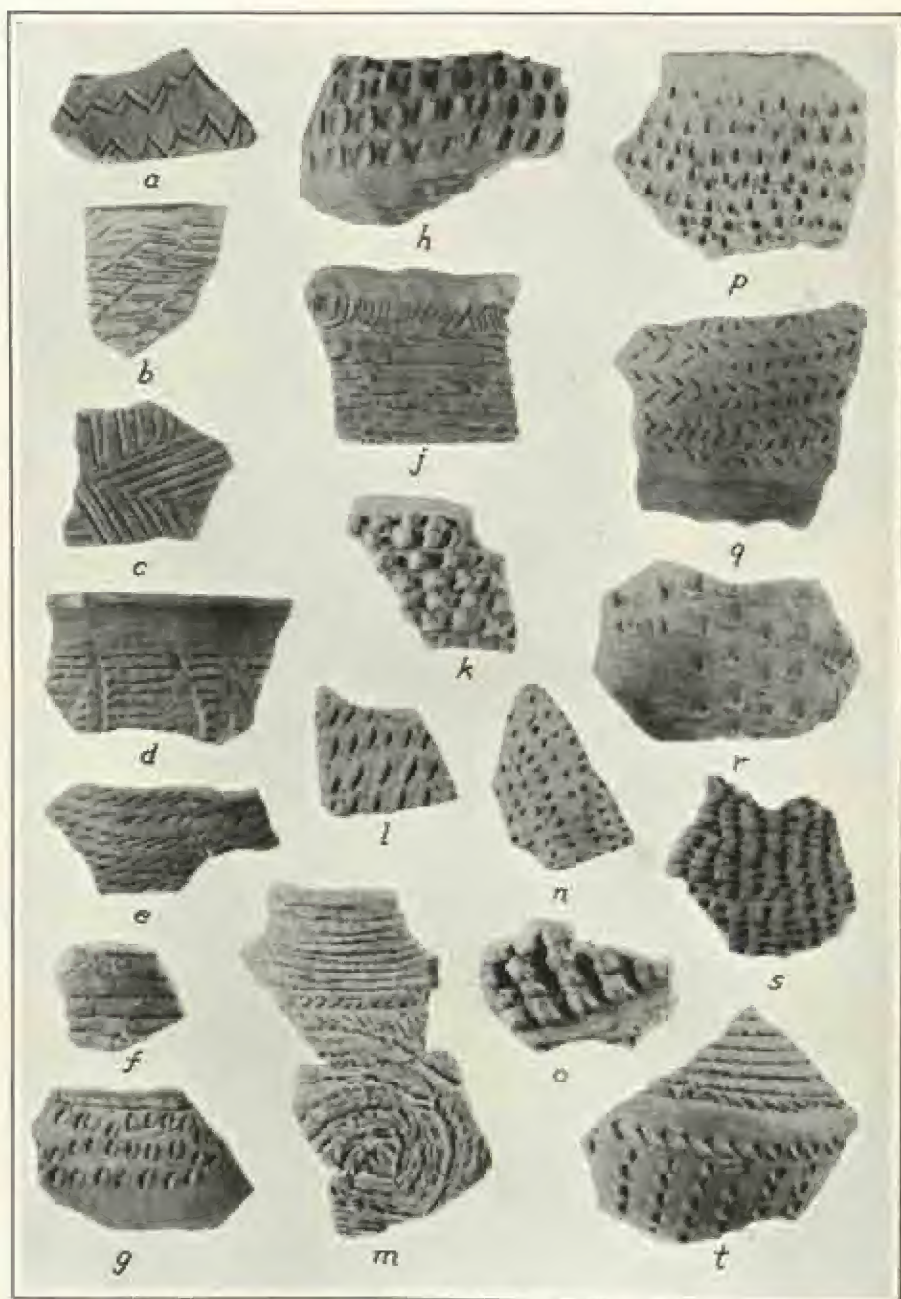
MINIMES CORRUGATED POTTERY

Minimes sharp to ribbed corrugated pottery; corrugations on *h* are scraped; technique used on a few sherds like *g* is obscure (the clay appears to have checked while sun-drying, giving a coarse brick effect). Indentations at juncture of corrugated and plain surface (*h* and *j*) seem to be a characteristic of Minimes ware. The sherd *a* is 5 inches long (page 83)



CORRUGATIONS ON OLLER NECKS

Corrugations on necks of ollers waved or manipulated to produce pleasing effects: surface of *a* has the appearance of faked corrugations. The sherd *c* is 5½ inches wide (page 83).



TOOL-MARKED POTTERY

Incised, pinched, fingernail, and stick-mark decorated pottery; only three sherds from Swarta, similar to *e*, show cord impressions; *f*, the only sherd having marks of a reed. The sherd *m* is $4\frac{1}{2}$ inches tall

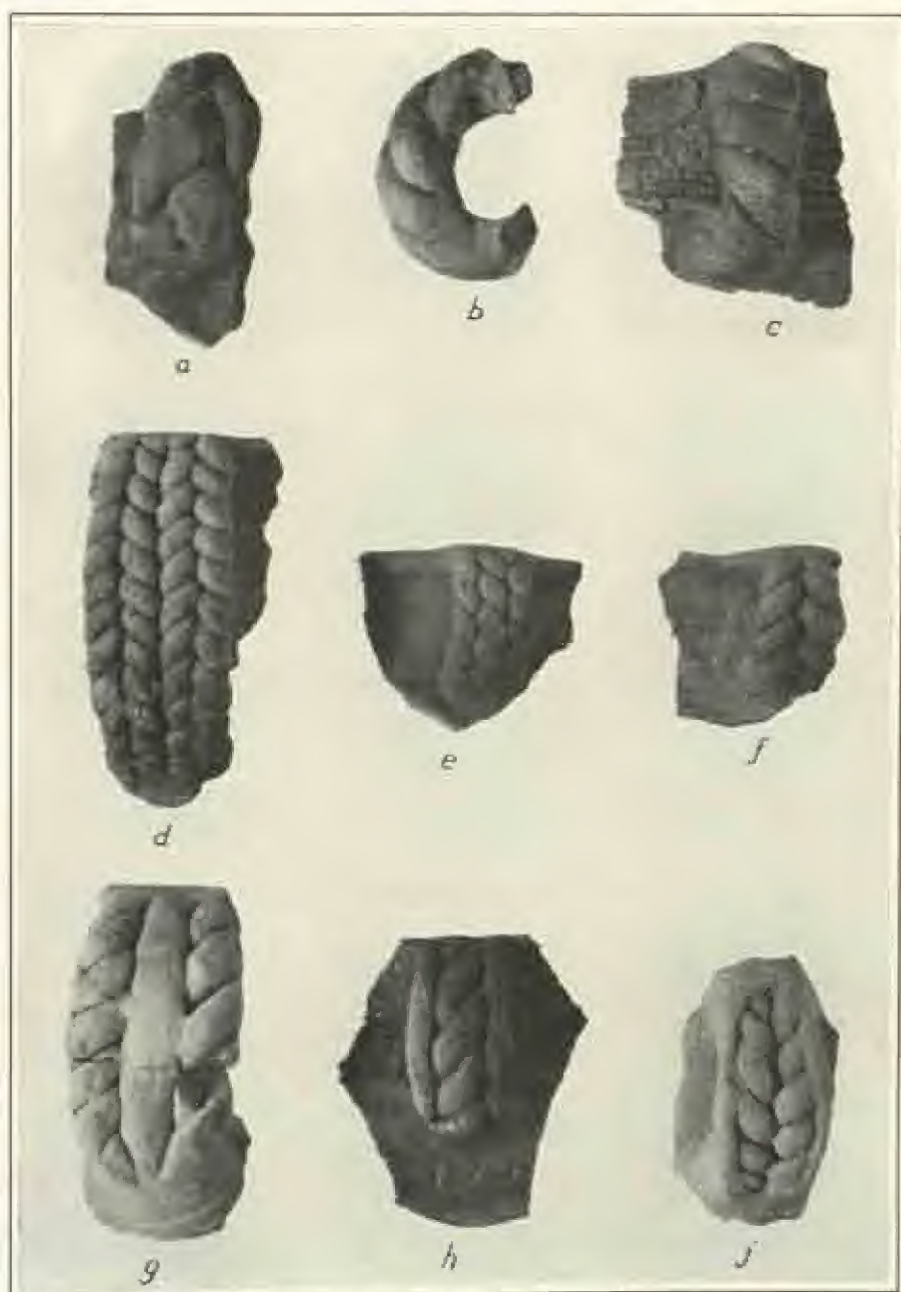


LADDER FRAGMENTS

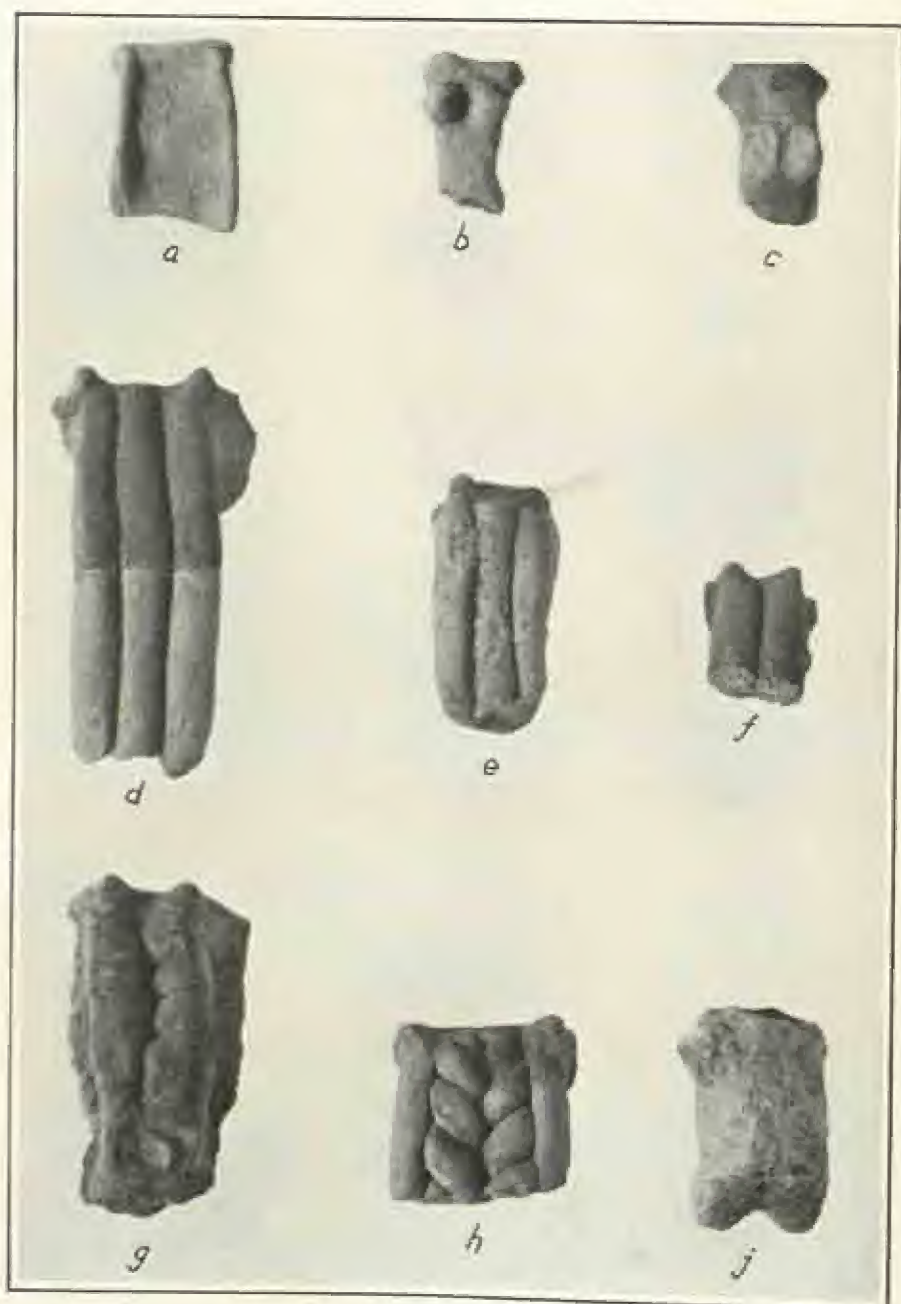
Ladders are unusual in the Mimbres area. The fragments *a* and *c* are trade pieces, from general digging; *b*, trade piece, from Room 88; *d*, *e*, and *h*, from general digging; *f*, with Skeleton 659, Room 71; *j*, with Skeleton 842, Room 83; *k*, below Room 110. Specimen *c* is 64 inches long (page 85)



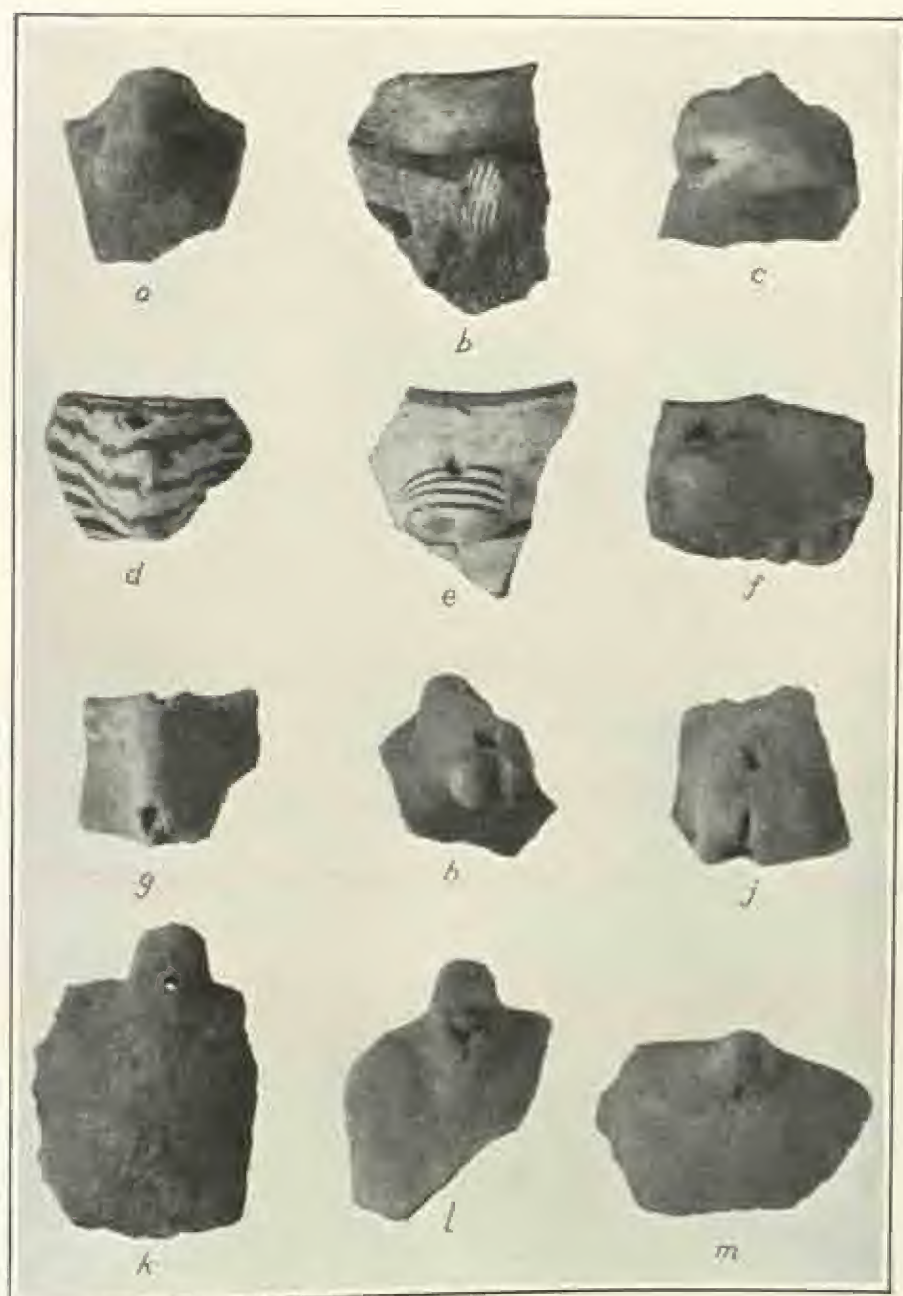
PLAIN VERTICAL HANDLES
 Specimen *a* is 3½ inches long (page 83)



TWISTED AND BRAIDED VERTICAL HANDLES
 Specimen *d* is 3½ inches long (page 86)

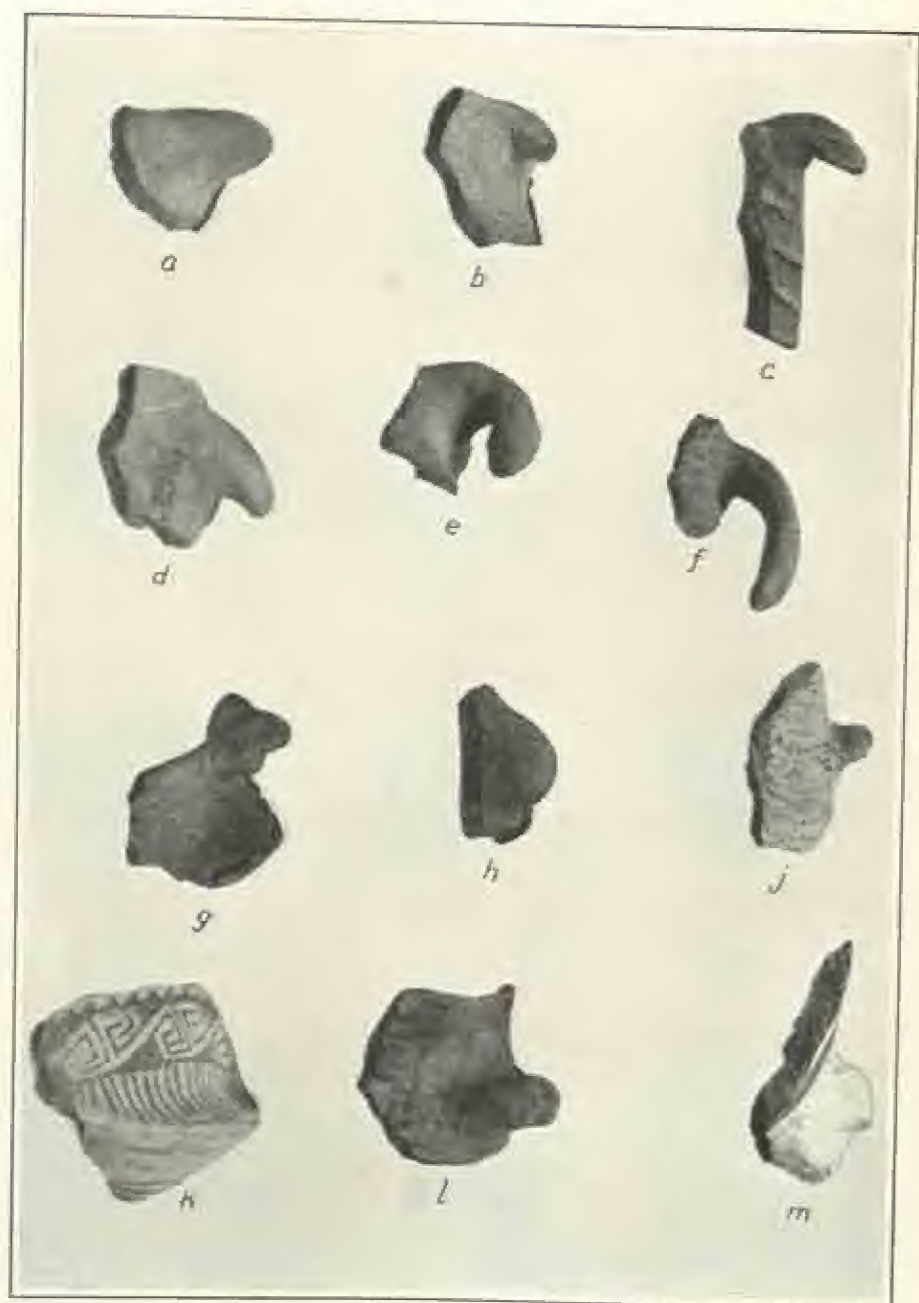


LIFE FORMS IN HARDEN
 Specimen *a* is 3 1/2 inches long (page 86)

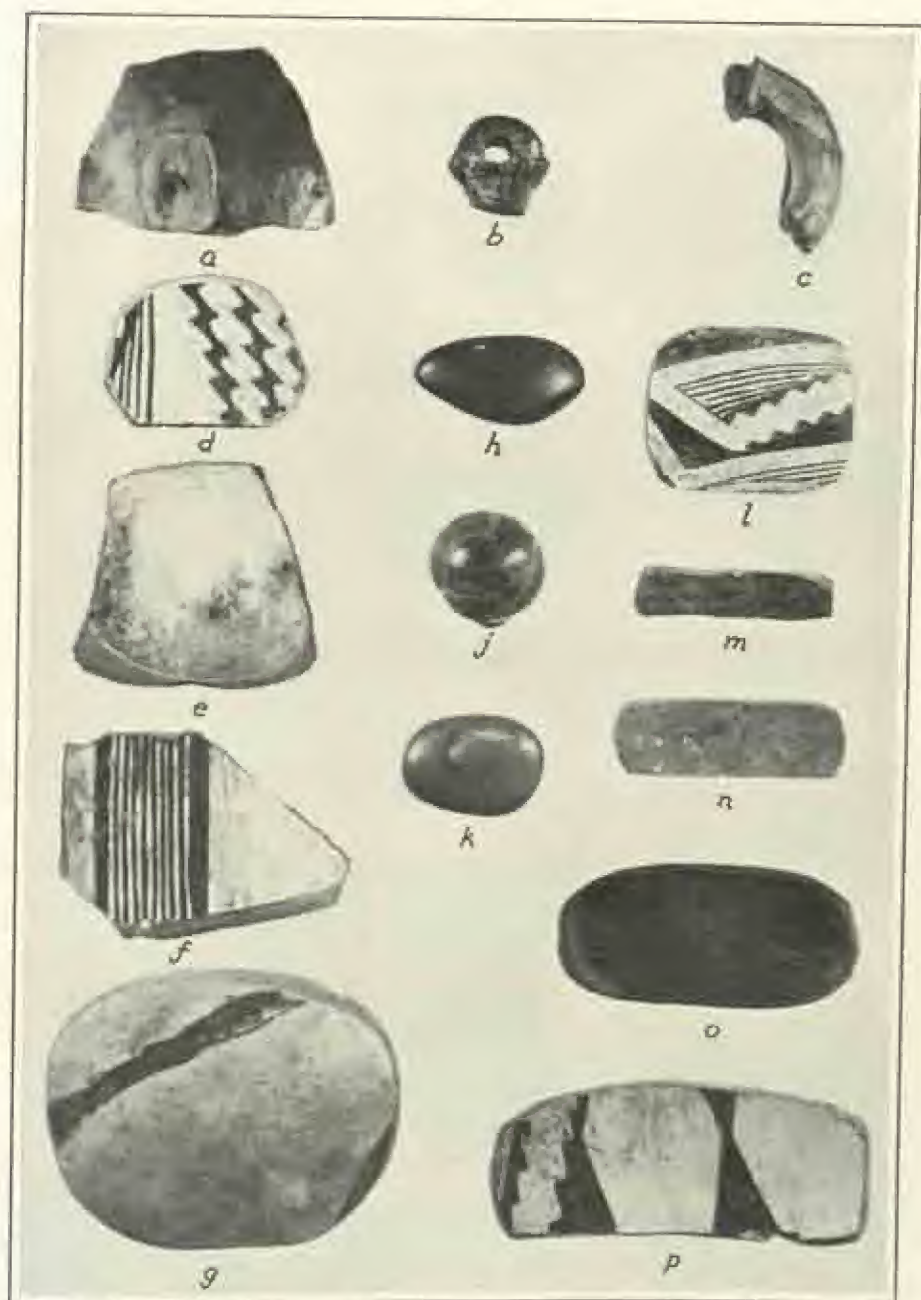


L.P. 100

The sherd *h* is 3 inches long (page 50)



UNFINISHED LOGS, FRAGMENTS, AND HOLES
The sherd *i* is 2½ inches long (page 87)



POTTER'S TOOLS AND ATTACHMENT OF HANDLES TO VESSELS

Specimens a-c show method of riveting logs and handles to vessels; d-g and l-p, potter's tools made from sherds; h, j, and k, pottery polishing stones. Specimen g is 4½ inches long (pages 87 and 88)



CLAY PIPES

The pipe *a* came from below floor of Room 103; *b*, on floor of Room 11; *c*, below floor of Room 83; *d*, general digging; *e*, below floor of Room 101; *f*, from fill of Room 23; *g*, below floor of Room 33; *h*, below floor of Room 83; *i*, below floor of Room 108. Specimen *h* is 2½ inches long (page 87).



POTTERY OBJECTS

Specimen *a* came from fill of Room 110; *b*, *c*, *e*, *g*, *h*, and *j*; general digging; *d*, below floor of Room 51; *f*, below floor of Room 4; *i*, from cache on floor of Room 5. Specimen *d* is 31 inches long (page 88)



EL PASO POLYCHROME

A few examples of forms and designs of decoration on El Paso polychrome pottery (page 93)



a



b



c



d



e



f

CHUPAHIGO BLACK-ON-WHITE DESIGNS

The bowl *a* came from Swarto Ruin in the Mimbres Valley; *b* was found 20 miles from Newman, New Mexico; *c* near La Lata, New Mexico; *d-f* came from a ruin at Three Rivers, New Mexico (page 33)

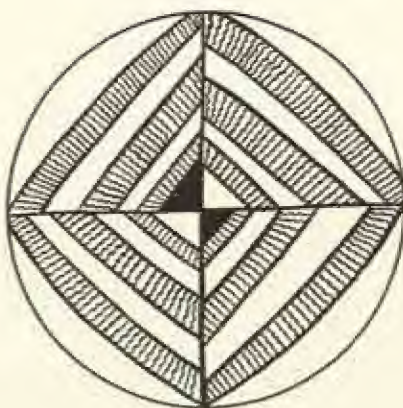


CHIRICAHUA BLACK-ON-WHITE POTTERY

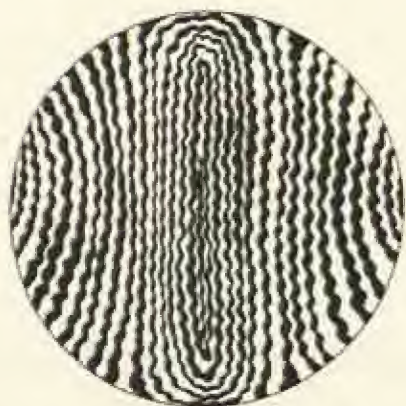
The vials *a* came from Three Rivers, New Mexico; *b*, 15 miles west of Sahual, Chihuahua, Mexico; *c*, near La Luz, New Mexico; *d* accompanied a Late burial at the Swarta Ruin; *c'* and *d'* are the reverse of *c* and *d* (page 93)



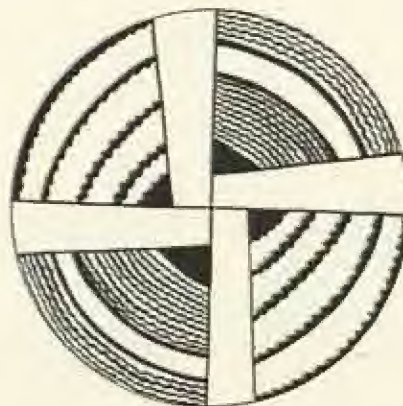
a



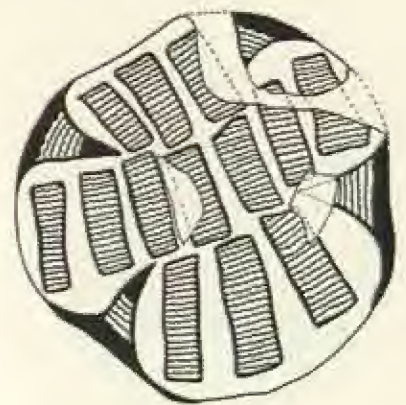
d



b



e



c



f



a



d



b



e



c



f



a



d



b



e



c



f

MIMAS: BOW-FACE. BLACK-ON-WHITE.

The bowl *e* shows a pair of projections on rim (life form ?)



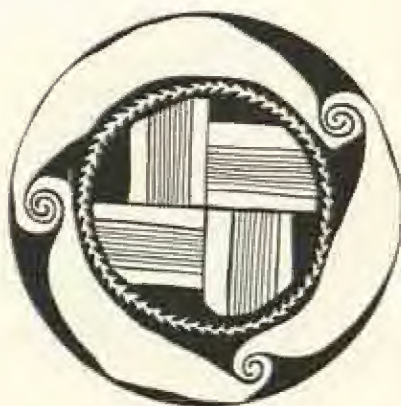
a



d



b



e



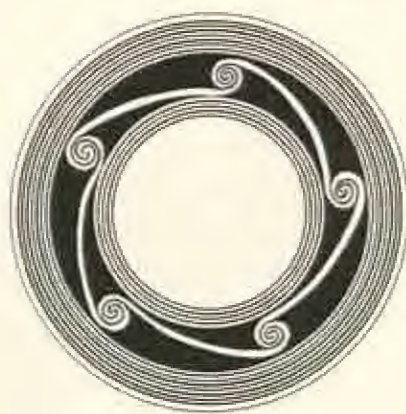
c



f



a



d



b



e



c



f

MIMBERG BOLD-FACE BLACK-ON-WHITE
The bowl *c* is three-rimmed



a



d



b



e



c



f



a



d



b



e



c



f



a



d



b



e



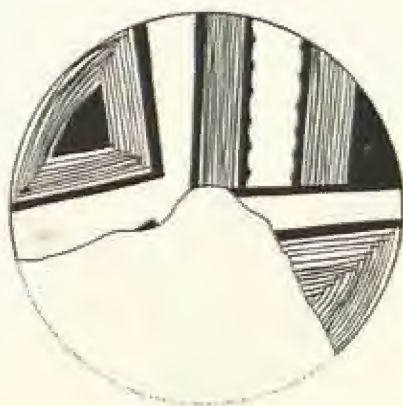
c



f

ATLANTA BOLD-FACE BLACK-ON-WHITE

The bowls *d* and *e* were found with Burial 371, a cremation



a



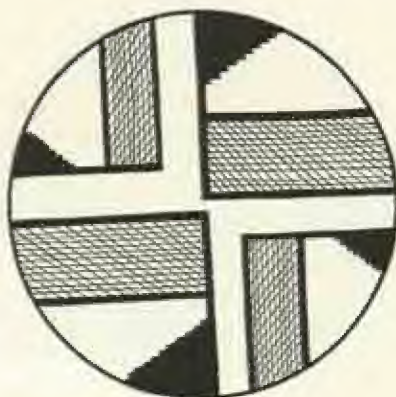
d



b



e



c



f



a



d



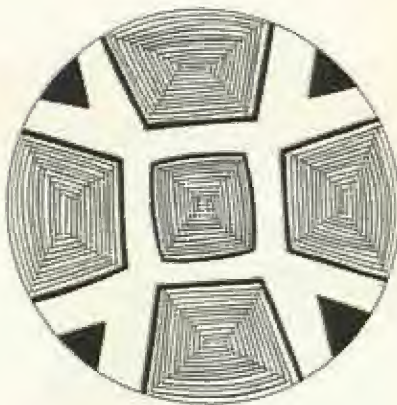
b



e



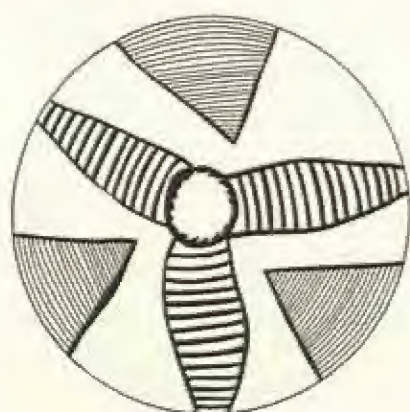
c



f

MIMESIS BOLD-FACE BLACK-ON-WHITE

The bowl *c* was found with Burial 371, a cremation



a



d



b



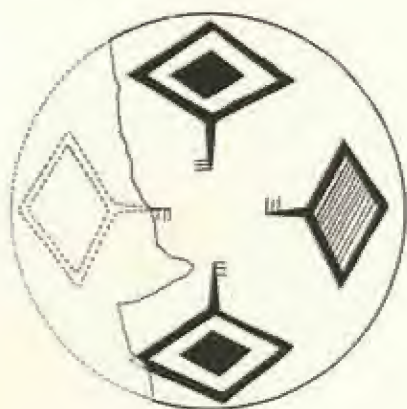
e



c



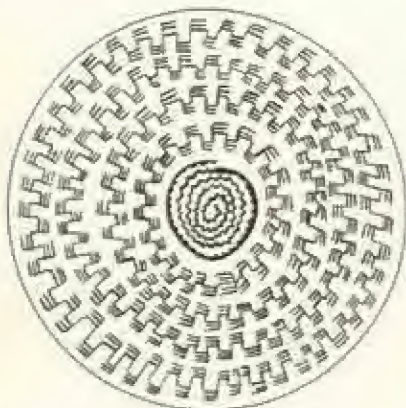
f



a



d



b



e



c



f



a



d



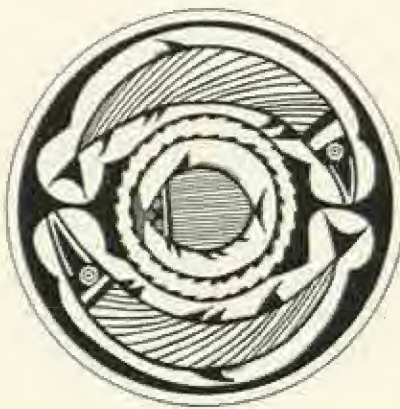
b



e



c

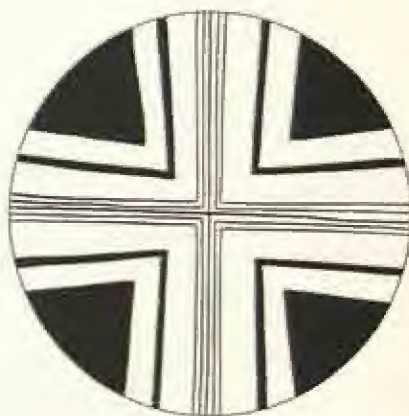


f

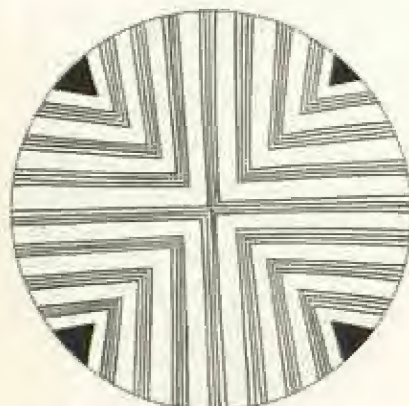
MIMMES. BOLD-FACT. BLACK-ON-WHITE
The bowl *d* was with Burial 371, a cremation



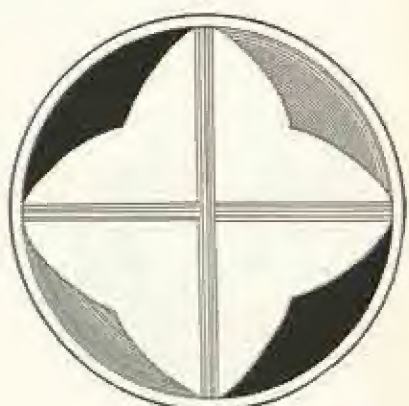
a



d



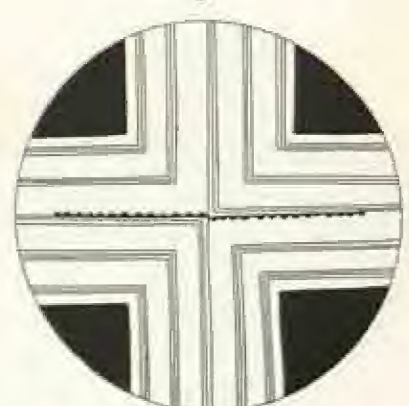
b



e



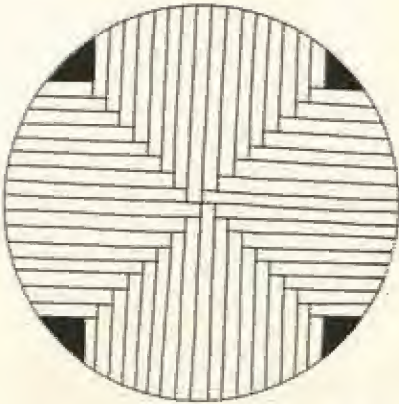
c



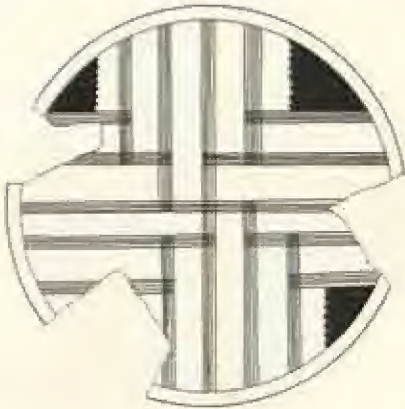
f

MIMUES CLASSIC BLACK-ON-WHITE

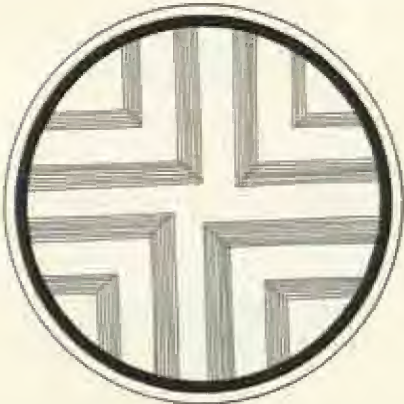
The design on *a* and the finish of vessel *b* suggest the Bold-face Black-on-white



a



d



b



e



c



f



a



d



b



e



c



f

MIDDLETOWN CLASSIC BLACK-ON-WHITE
The bowls *c* and *f* are flare-rimmed



a



d



b



e



c

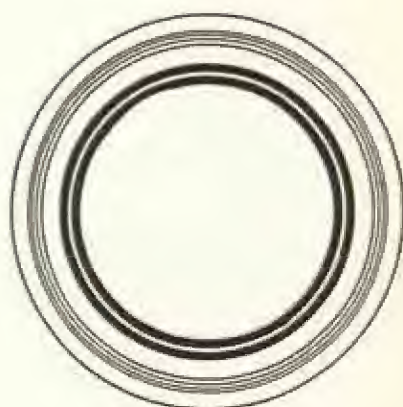


f

MIDDEN CLASSIC BLACK-ON-WHITE
The bowl *e* is flare-rimmed



a



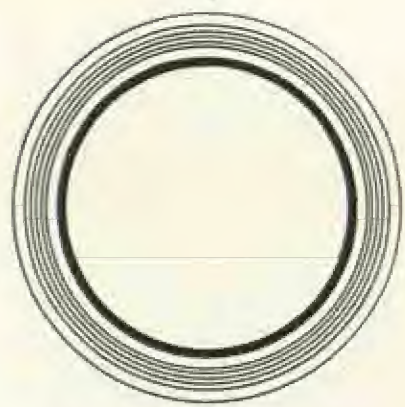
d



b



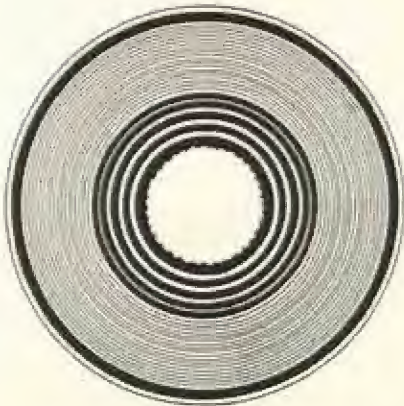
e



c



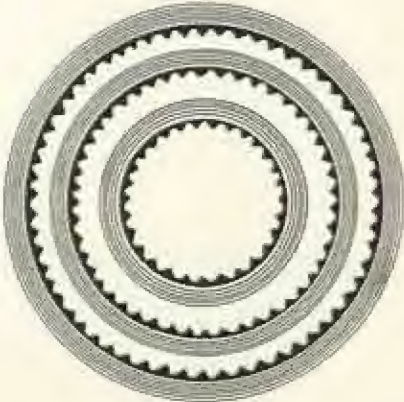
f



a



d



b



e

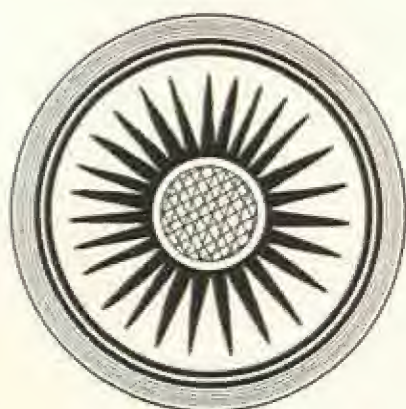


c



f

MIMBRES CLASSIC BLACK-ON-WHITE
The bowl *d* is rare-rimmed



a



d



b



e



c



f

NEWBERRY CLASSIC BLACK-ON-WHITE
The bowl *c* was found with Burial 1867, a cremation



a



d



b



e



c



f

MIMBRES CLASSIC BLACK-ON-WHITE
The bowl *d* was found with Burial 467, a cremation



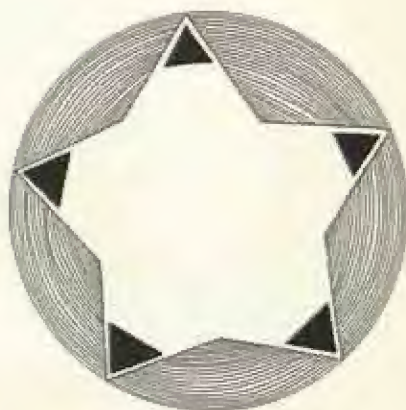
a



d



b



e



c



f

MINUTES—CLASSIC—BLACK-ON-WHITE

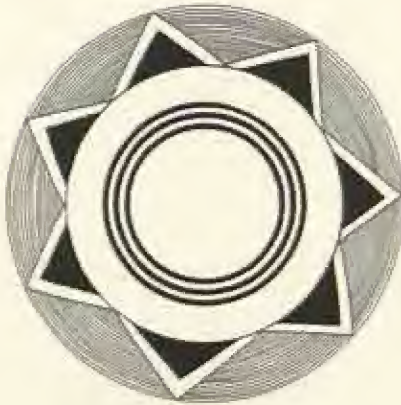
The drawing *b* is from an olla with a small orifice; *c* and *f*, flare-rimmed bowls



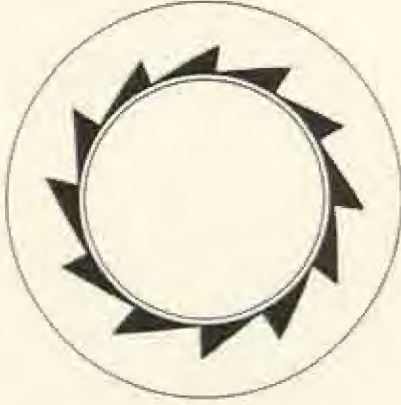
a



d



b



e



c



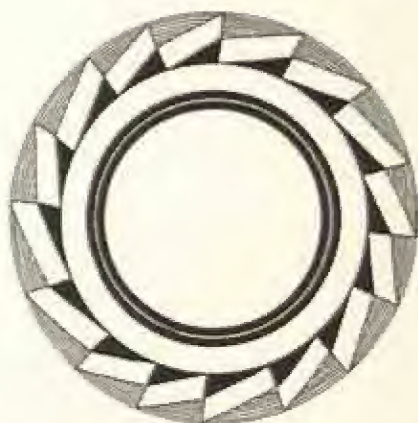
f

MIMBRES CLAMSH: BLACK-ON-WHITE

The bowls *b*, *c*, and *f* are flare-rimmed; *e*, seed bowl



a



d



b



e



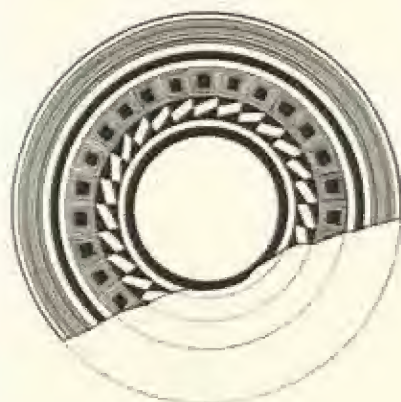
c



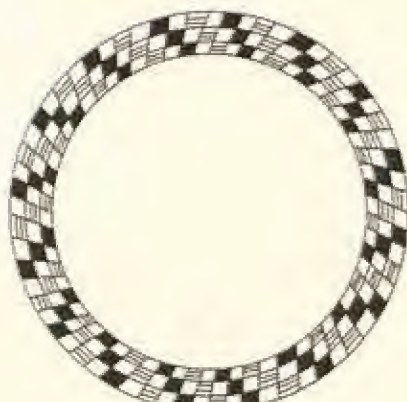
f

MIMBREA CLASSIC BLACK-ON-WHITE

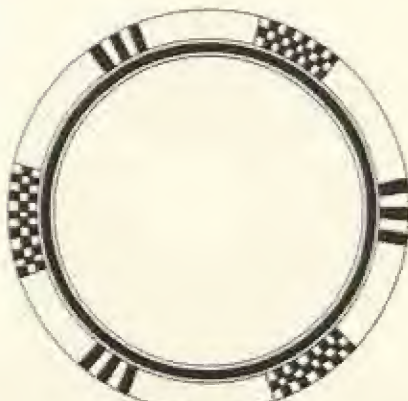
The decoration *a* is from an olla; *c* and *d*, flare-rimmed bowls; *e*, seed bowl



a



d



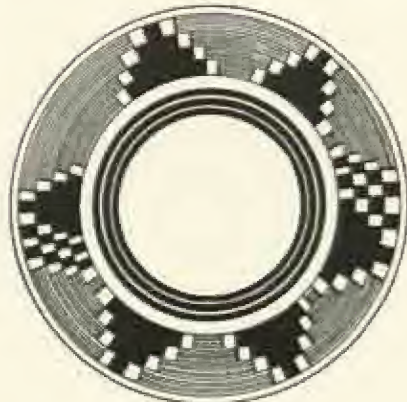
b



e



c



f

MIRRIS CLASSIC BLACK-ON-WHITE
The bowls *b*, *d*, and *f* are face-rimmed



a



d



b



e



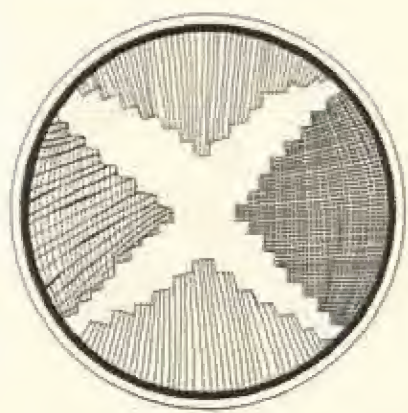
c



f

MUMUKS CLASSIC BLACK-ON-WHITE

The bowl b is flare-rimmed; c is an olla



a



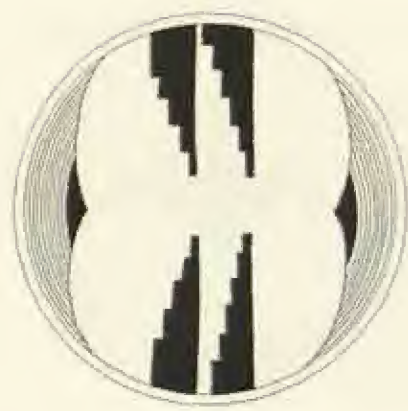
d



b



e



c



f



a



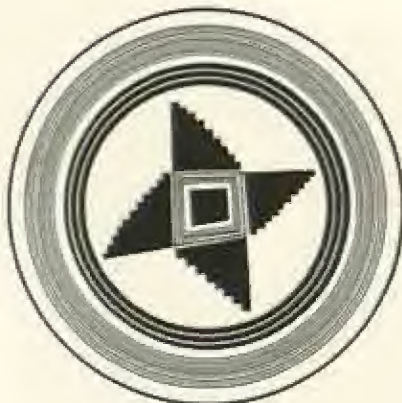
d



b



e



c



f



a



d



b



e



c



f

MIMBRES CLASSIC BLACK-ON-WHITE
The bowl *f* is flare-rimmed



a



d



b



e



c



f

MIMBRES CLASSIC BLACK-ON-WHITE

The drawing *c* is from an olla



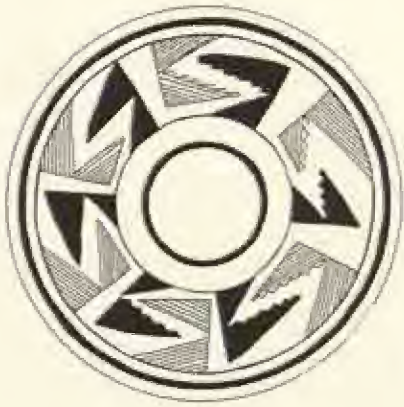
a



d



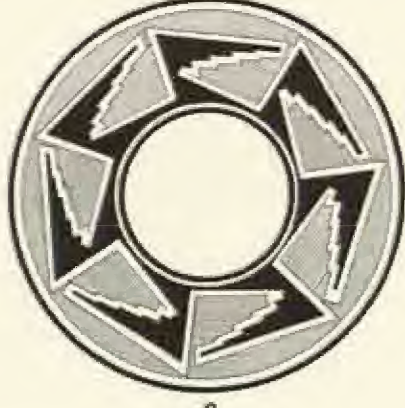
b



e



c



f



a



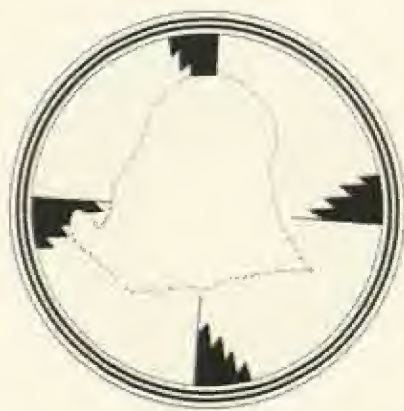
d



b



e



c



f

MINNESOTA CLASSIC BLACK-ON-WHITE
The bowl b is flare-rimmed



a



d



b



e



c



f



a



d



b



e



c



f



a



d



b



e



c



f

MIMBRES CLASSIC BLACK-ON-WHITE
The bowl *c* is flare-rimmed



a



d



b



e



c



f

MIMBRE CLASSIC BLACK-ON-WHITE
The drawing *a* is from an olla



a



d



b



e



c



f

MINER'S CLASSIC BLACK-ON-WHITE
The drawing *c* is from an olla.



a



d



b



e



c



f



a



d



b



e



c



f



a



d



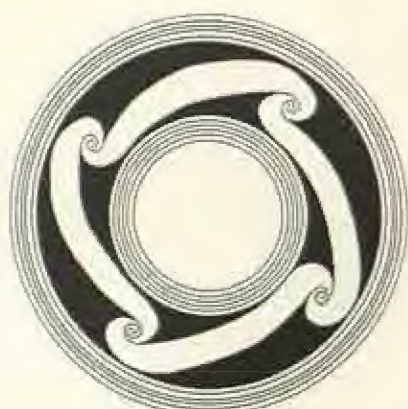
b



e



c



f

MIMICRY CLAY: BLACK-ON-WHITE
The drawing *b* is from an olla



a



d



b



e



c



f

MIMBRES CLASSIC BLACK-ON-WHITE
The drawing *a* is from a seed bowl.



a



d



b



e



c



f

MIRRORS CLASSIC BLACK-ON-WHITE
The bowl of is base-returned



a



d



b



e



c



f



a



d



b



e



c



f

MIMBON CLASSIC BLACK-ON-WHITE
The drawing a is from a seed bowl



a



d



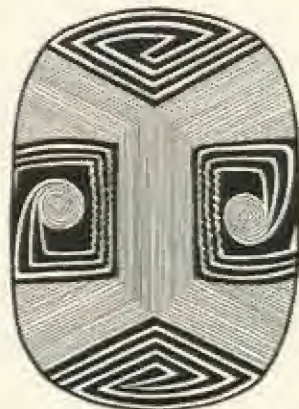
b



e



c



f

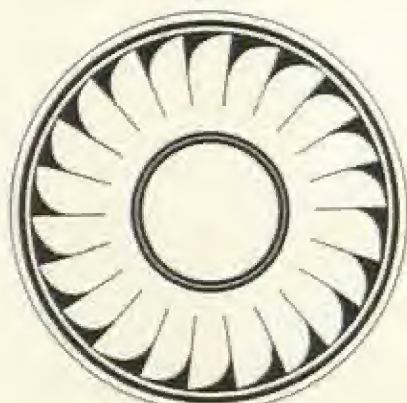
MIMIDIA CLASSIC BLACK-ON-WHITE
The bowl *d* is flange-rimmed



a



d



b



e



c



f

MIMBES CLASSIC BLACK-ON-WHITE
The bowl of is hare-rimmed



a



d



b



e



c



f



a



d



b



e



c



f



a



d



b



e



c

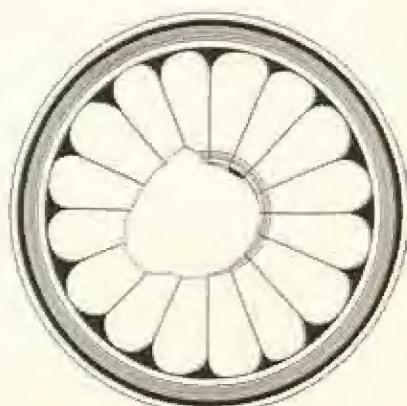


f

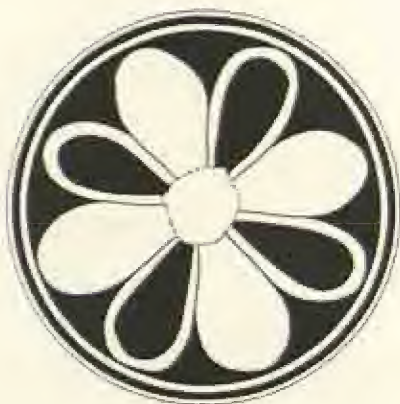
MIMBERS CLASSIC BLACK-ON-WHITE
The bowl / is flare-rimmed



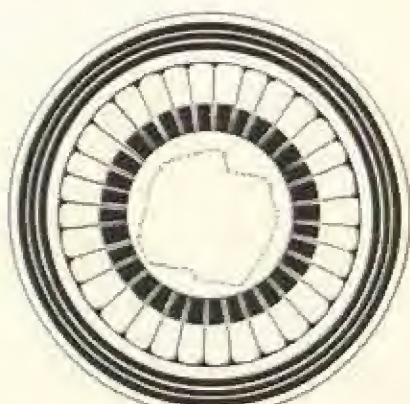
a



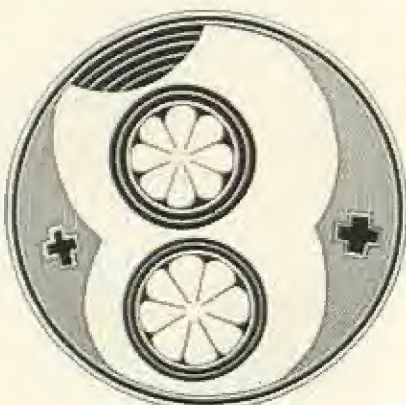
d



b



e



c



f

MINDEN CLASSIC BLACK-ON-WHITE
The bowl f is flared-rimmed



a



d



b



e



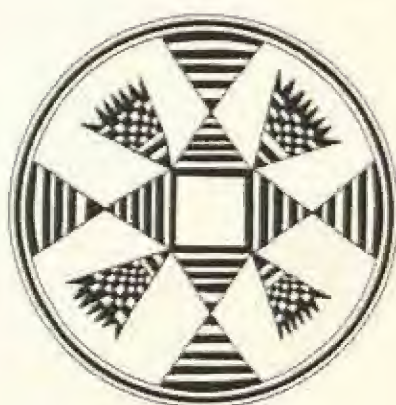
c



f



a



d



b



e



c



f



a



d



b



e



c



f



a



d



b



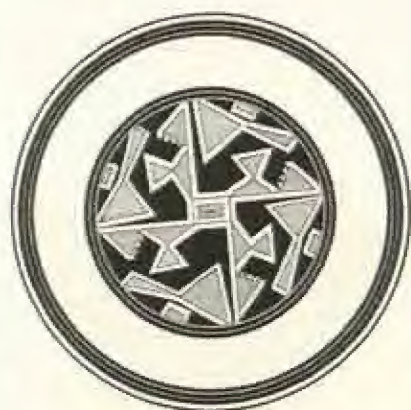
e



c



f



a



d



b



e



c



f

MIRRORS CLASSIC BLACK-ON-WHITE.
The bowl *b* was with Burial 365, a cremation



a



d



b



e



c



f



a



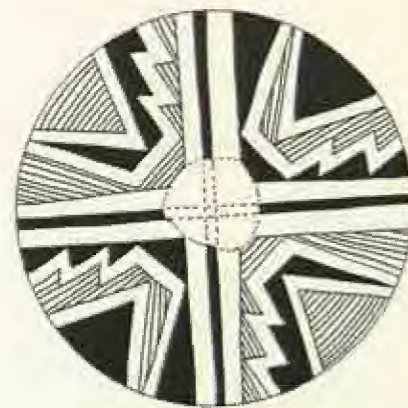
d



b



e



c



f

MIMBRES CLASSIC BLACK-ON-WHITE
The bowl *d* is flare-rimmed



a



b



c



d



e



f



a



d



b



e



c



f



a



d



b



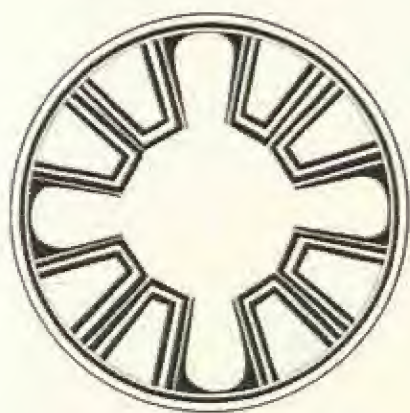
e



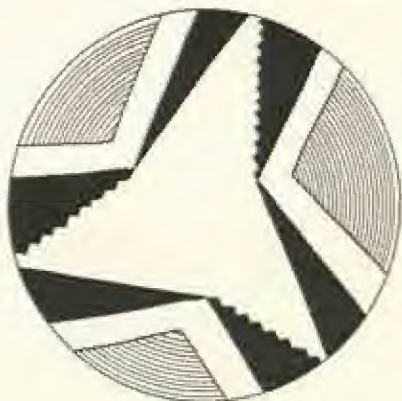
c



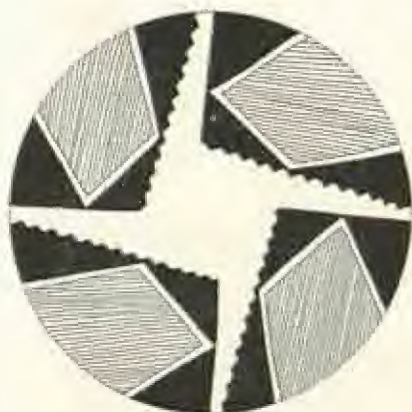
f



a



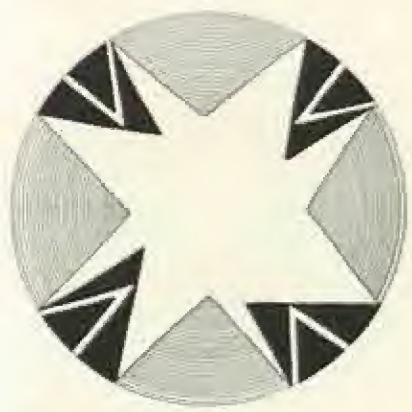
d



b



e



c



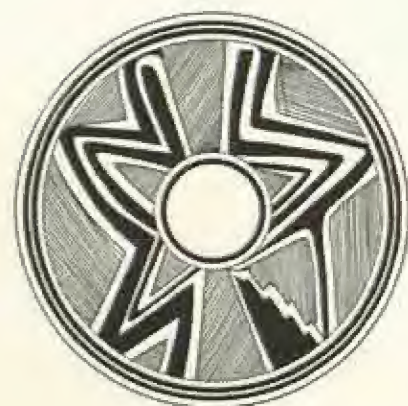
f



a



d



b



e



c



f



a



d



b



e



c



f



a



d



b



e



c



f

MISSES CLASSIC BLACK-ON-WHITE
The bowl *c* is three-rimmed; *f*, a seed bowl



a



d



b



e



c



f



a



d



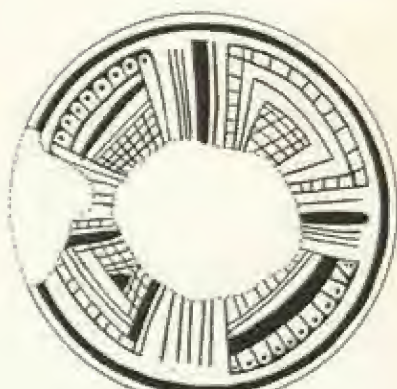
b



e

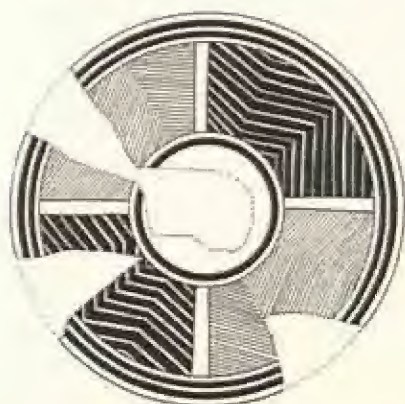


c



f

STURGES CLASSIC BLACK-ON-WHITE
The bowl *b* is flare-rimmed



a



d



b



e



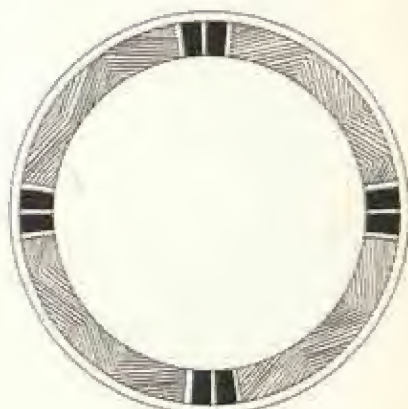
c



f



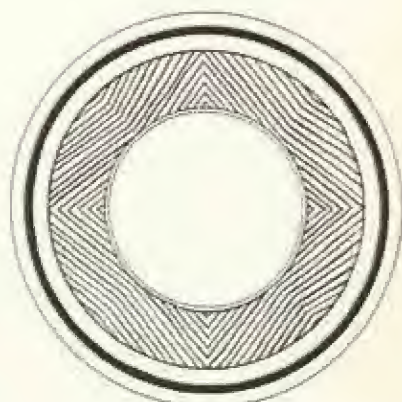
a



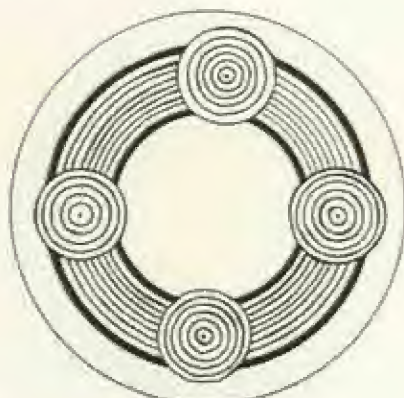
d



b



e



c



f

MEMBERS CLASSIC BLACK-ON-WHITE

The bowls *a* and *d* are flare-rimmed; *b* and *e*, seed bowls



a



d



b



e



c



f

MINNESOTA CLASSIC BLACK-ON-WHITE
All are flare-rimmed bowls except *e*



a



d



b



e



c



f

MINNESOTA CLASSIC BLACK-ON-WHITE
The bowls a, b, and c are flare-rimmed



a



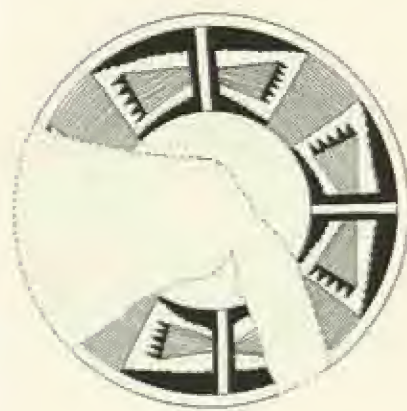
d



b



e



c

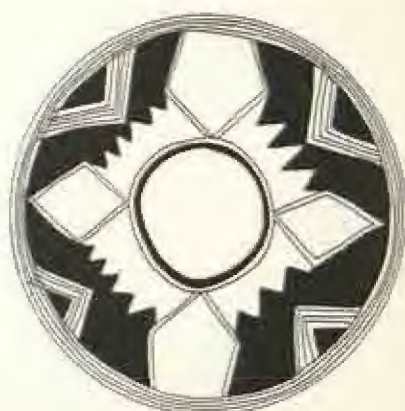


f

MIXTES CLASSIC BLACK-ON-WHITE
The bowls *d* and *e* are flare-rimmed.



a



d



b



e



c



f



a



d



b



e



c



f

MINNEKA CLAYE BLACK-ON-WHITE

The fragment *f* was found over the skeleton of a rabbit



a



d



b



e



c



f



a



d



b



e



c



f



a



d



b



e



c



f

MIMBEN CLASSIC BLACK-ON-WHITE
The drawing *b* is from an olla



a



d



b



e



c



f



a



d



b



e

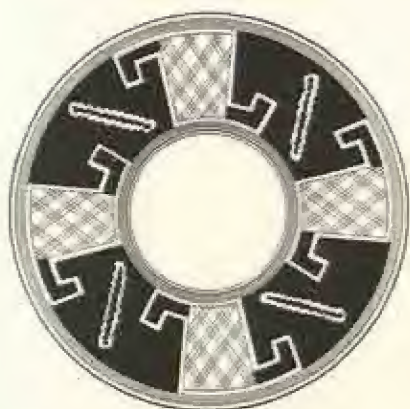


c



f

MIMBRES CLASSIC BLACK-ON-WHITE
The bowl *e* is flare-rimmed



a



d



b



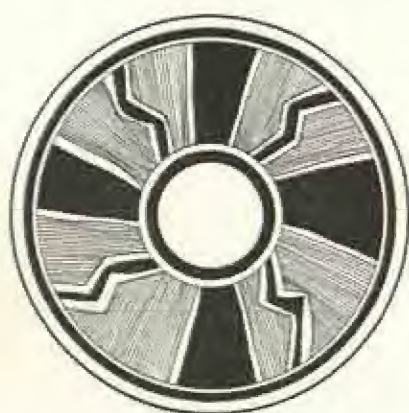
e



c



f



a



d



b



e



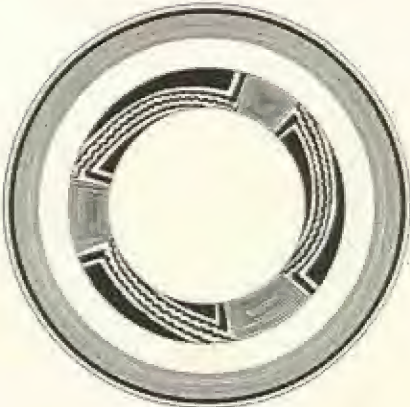
c



f



a



d



b



e



c



f

MIMBRES CLASSIC BLACK-ON-WHITE
The drawings b and c are from seed bowls



a



d



b



e



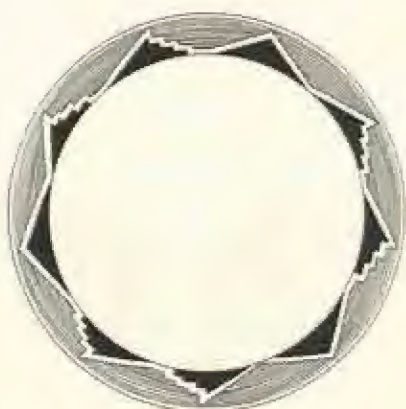
c



f



a



d



b



e



c



f

MIMBES CLASSIC BLACK-ON-WHITE
The bowls c and d are three-rimmed



a



b



c



d



e



f

MIMBRES POTTERY DESIGNS

Nearest duplicates in design on pottery at Swartz: *a* and *b* Mimbres Bold-face;
c-f Mimbres Classic (page 74).



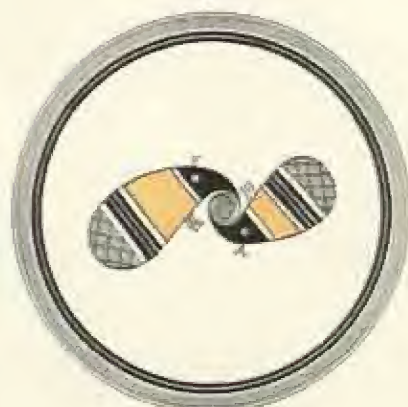
a



d



b



e



c



f

MIMRES-CLASSIC POLYCHROME

The bowl *d* is flare-rimmed. Colors vary from light brown to creamy buff; only one of the numerous shades was used in these reproductions (page 79)



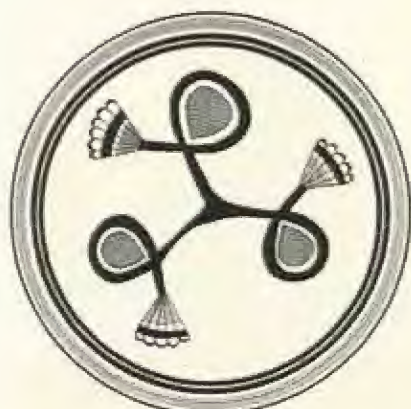
MINERVA CLASSIC POLYCHROME
The sherd c is 4 1/2 inches long (page 79)



a



d



b



e

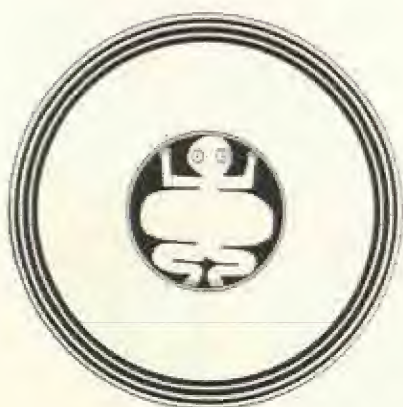


c



f

MIMBER CLASSIC BLACK-ON-WHITE
Glycymeris shell bracelets are depicted at c



a



d



b



e



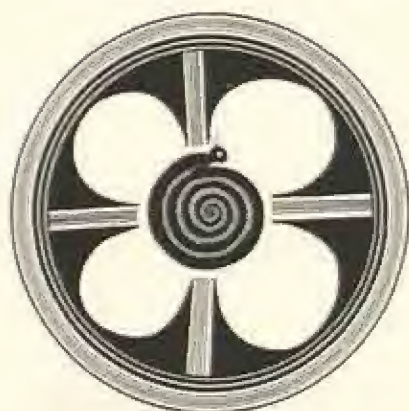
c



f



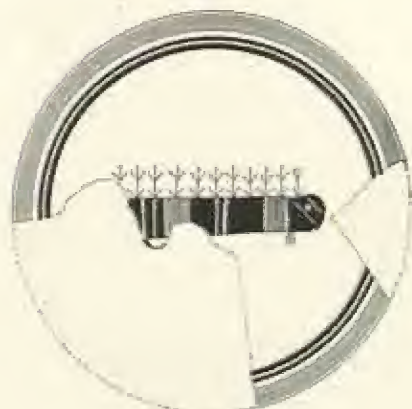
a



d



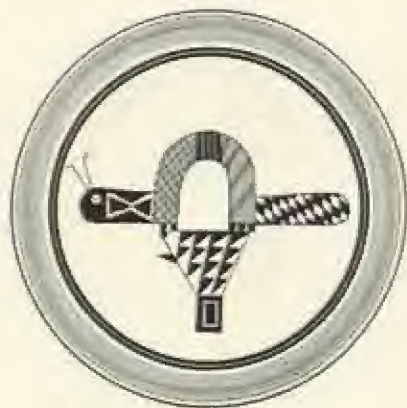
b



e



c



f

MIMICRY CLASSIC BLACK-ON-WHITE

AA & the conventionalized bird form in negative is at first difficult to visualize;
f, measuring worm mounted on carrying basket (note the triangular projection on
side of basket representing the hand band)



a



d



b



e



c



f



a



d



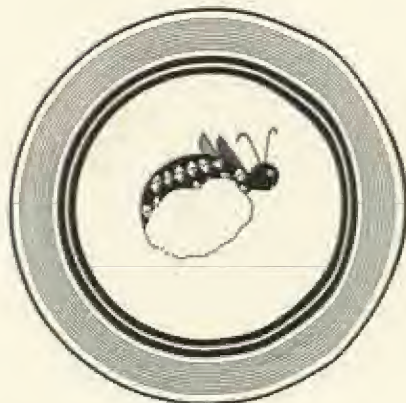
b



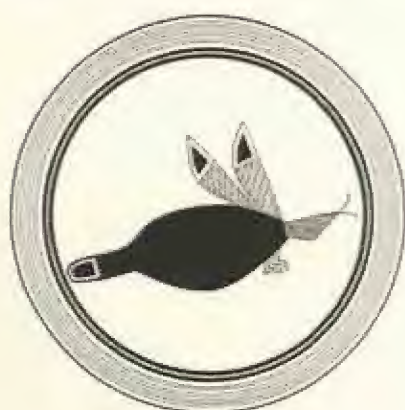
e



c



f



a



d



b



e



c



f



a



d



b



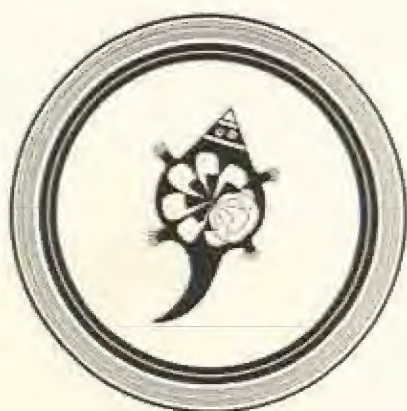
e



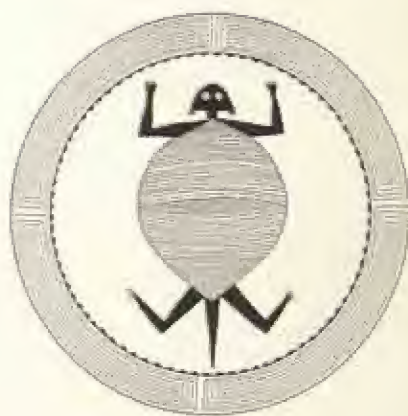
c



f



a



d



b



e



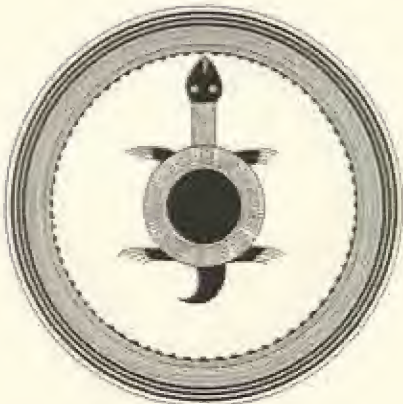
c



f



a



d



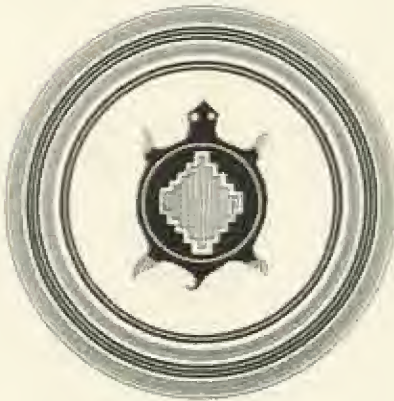
b



e



c



f



a



d



b



e



c



f

MINNESOTA CLASSIC BLACK-ON-WHITE
The bowl is flare-rimmed



a



d



b



e



c



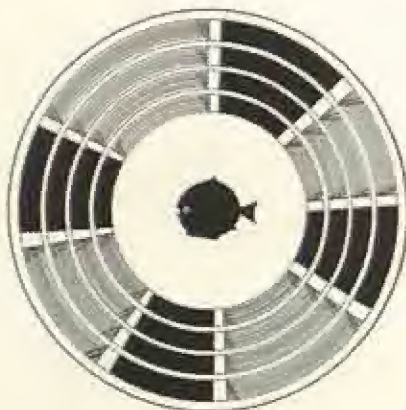
f



a



d



b



e



c



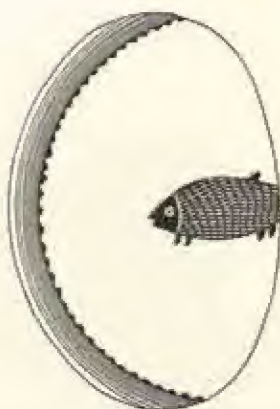
f



a



d



b



e



c



f

MIMBES CLASSIC BLACK-ON-WHITE

The drawing *b* is from a broken bowl sherd which had been smoothed to convert it into a scoop or ladle. In the multiple line border of *f*, 15 accurately spaced lines were used to make up a ribbon band $\frac{1}{4}$ of an inch wide



a



d



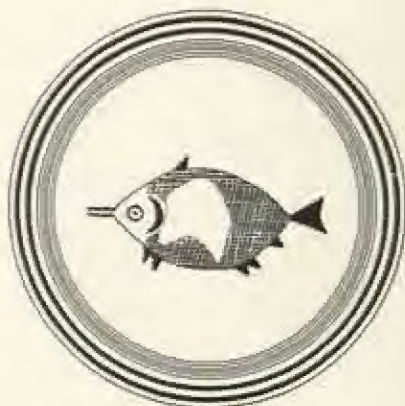
b



e



c



f



a



d



b



e



c



f



a



d



b



e



c



f

MIMURUS CLASSIC BLACK-ON-WHITE
The bowl e is flare-rimmed.



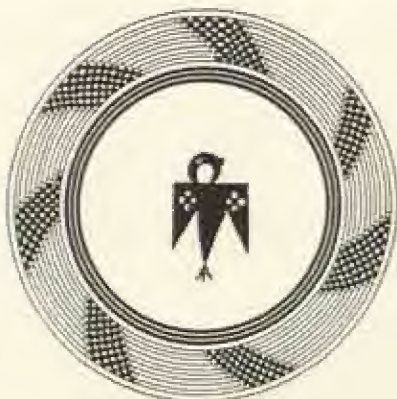
a



d



b



e



c



f



a



d



b



e



c



f



a



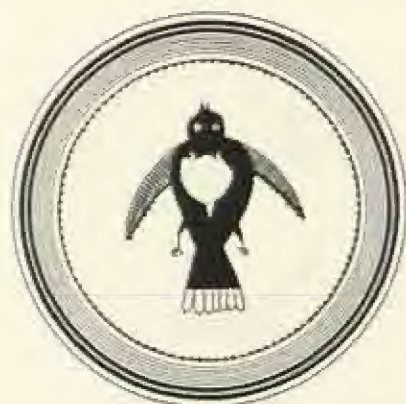
d



b



e



c



f



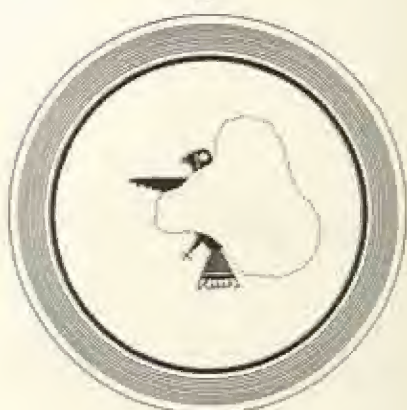
a



d



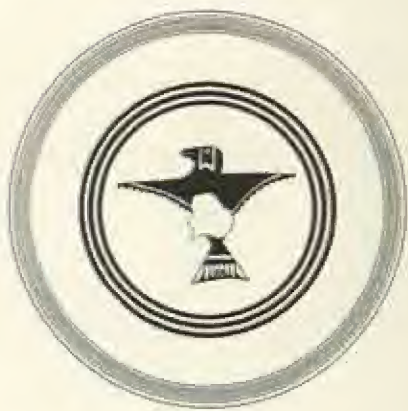
b



e



c



f

MIDDEN CLASIC BLACK-ON-WHITE
The bowl is flange-rimmed



a



d



b



e



c



f

MIMBRES CLASSIC BLACK-ON-WHITE

The decoration on *a* is polychrome, the band on the neck and tail and the checkers on the bird's body being in color



a



d



b



e



c



f



a



d



b



e



c



f



a



d



b



e



c



f



a



d



b



e



c



f



a



d



b



e



c



f



a



d



b



e



c



f



a



d



b



e



c



f



a



d



b



e



c



f



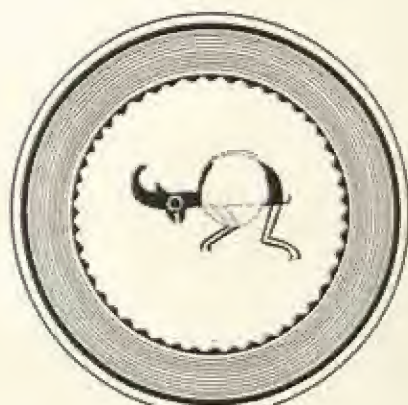
a



d



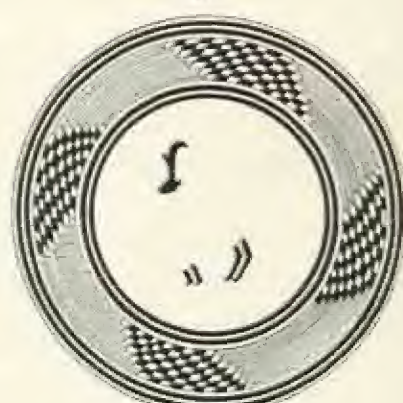
b



e



c



f



a



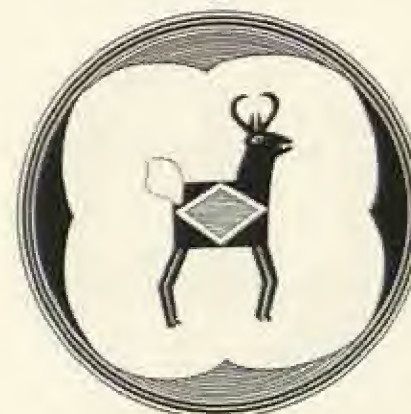
d



b



e



c



f



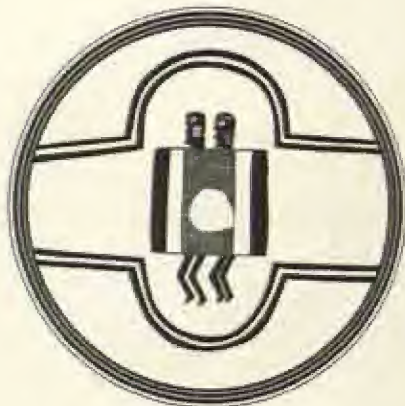
a



d



b



e



c



f



THE MIMERA MAN WITH AND WITHOUT MARK

No human figures were found at Swarts on Bold-face pottery. The shard *d* is 3½ inches long (page 74)



a



d



b



e



c



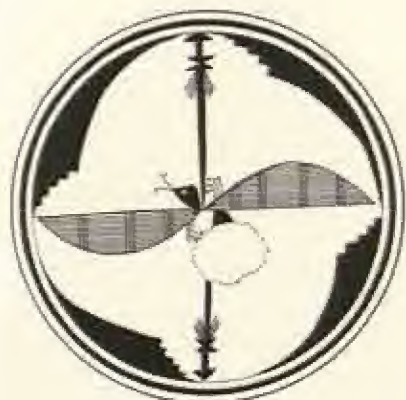
f



a



d



b



e



c



f

MIMERS CLASSIC BLACK-ON-WHITE

The roundel paho is seen in a and b; d, a ceremony in which roundel paho, crooked paho, and large carrying baskets are shown



a



d



b



e



c



f

MICHIGAN CLASSIC BLACK-ON-WHITE
The bowl c was with Burial 467, a cremation



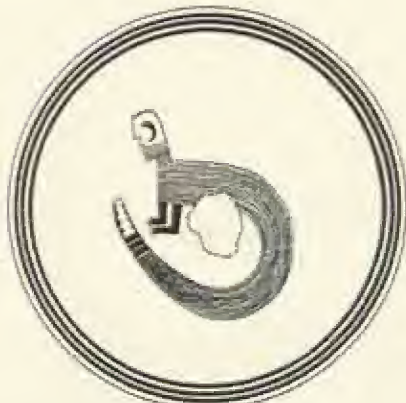
a



d



b



e



c



f

MIMMER CLASSIC BLACK-ON-WHITE

The bowl *d* is flint-rimmed



a



d



b



e

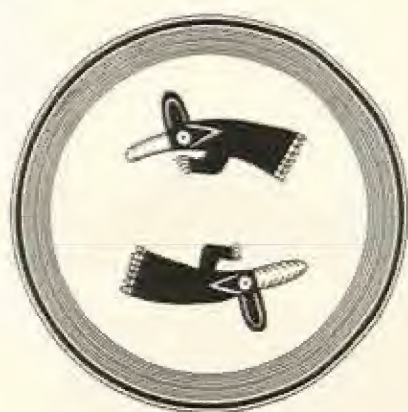


c



f

MIMERS' CLASSIC BLACK-ON-WHITE
The bowl *b* is flare-rimmed



a



b



c



d



e



f



g



h



i



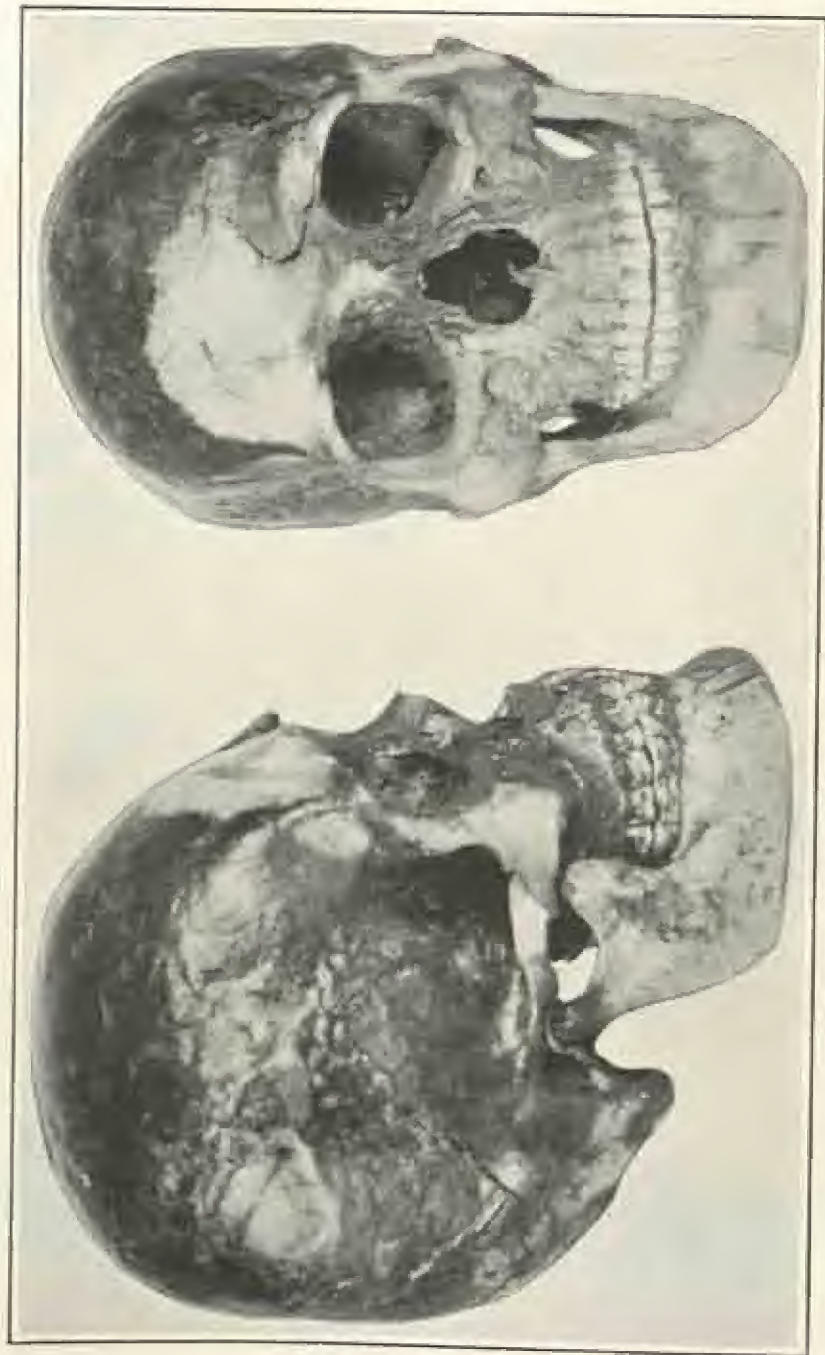
k



l

MIMBRES CLASSIC BLACK-ON-WHITE

The sherds c-l are unusual; i is the only representation of human form which might belong to the Mimbres Bold-face type of pottery.



TYPICAL MIMBRES SKULL, OLD MALE



TEYATEYAN SKULL, OLD MAN

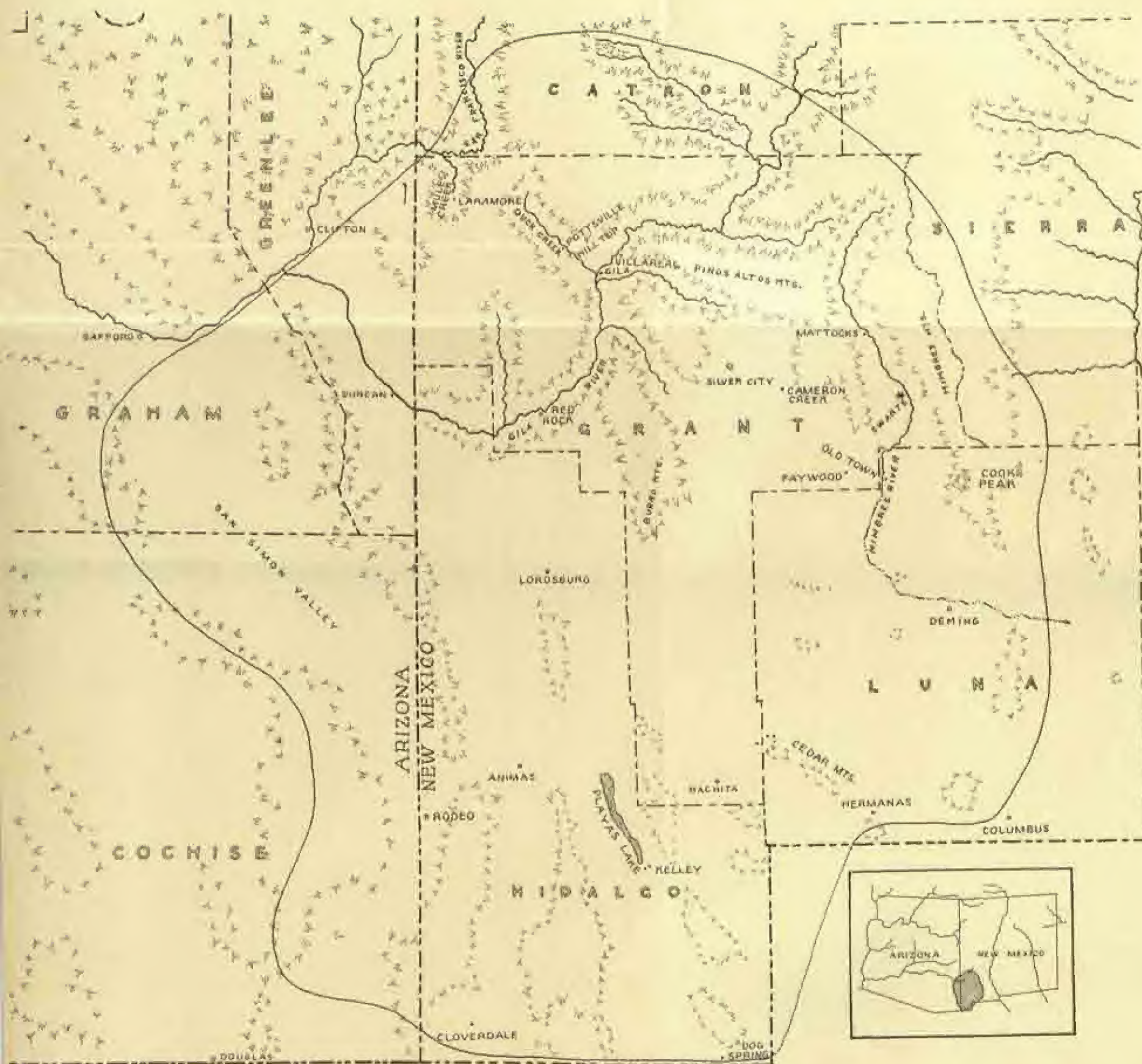


CRAN OF KAYAN PROUSALIM, OLD MALE, (page 128)

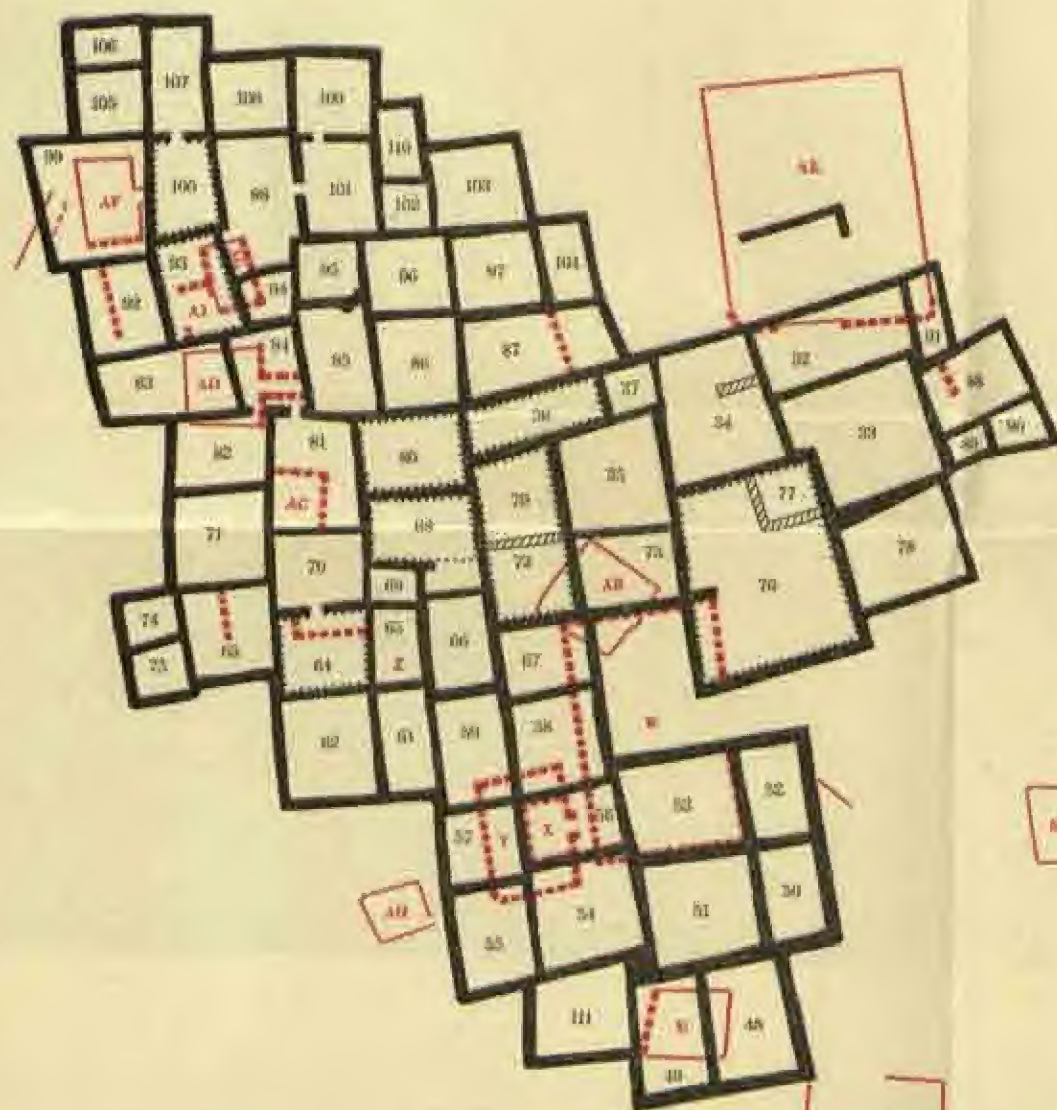


TEETH

Specimen a, two supernumerary teeth anterior to canines; b, marked development of basal cusp; c, fusion of median and lateral incisors, deciduous dentition; b and c are enlarged in reproduction (pages 156, 157, and 160)



MIMBRENE AREA AS KNOWN IN 1930

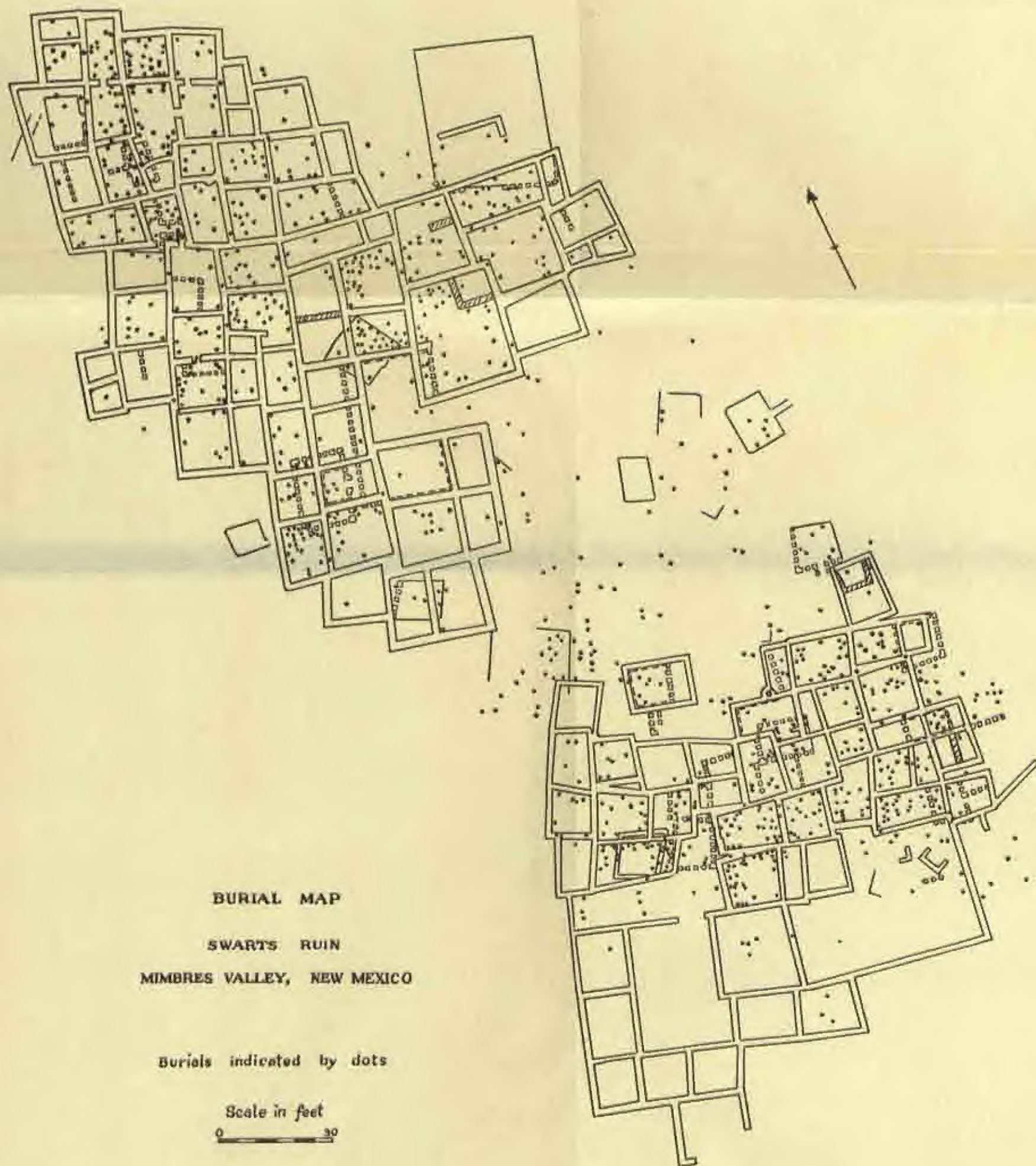


SWARTS RUIN, MINIBRES VALLEY, NEW MEXICO

- LATE PERIOD
- RUBBLE WALL
 - ADDED RUBBLE WALL
 - TWO FLOOR LEVELS
- EARLY PERIOD WALLS
- RUBBLE
 - PUDDLED ADGHE
 - PLASTER ON SOIL

SCALE IN FEET
0 20









CATALOGUE

N.C

"A book that is shut is but a block"

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